

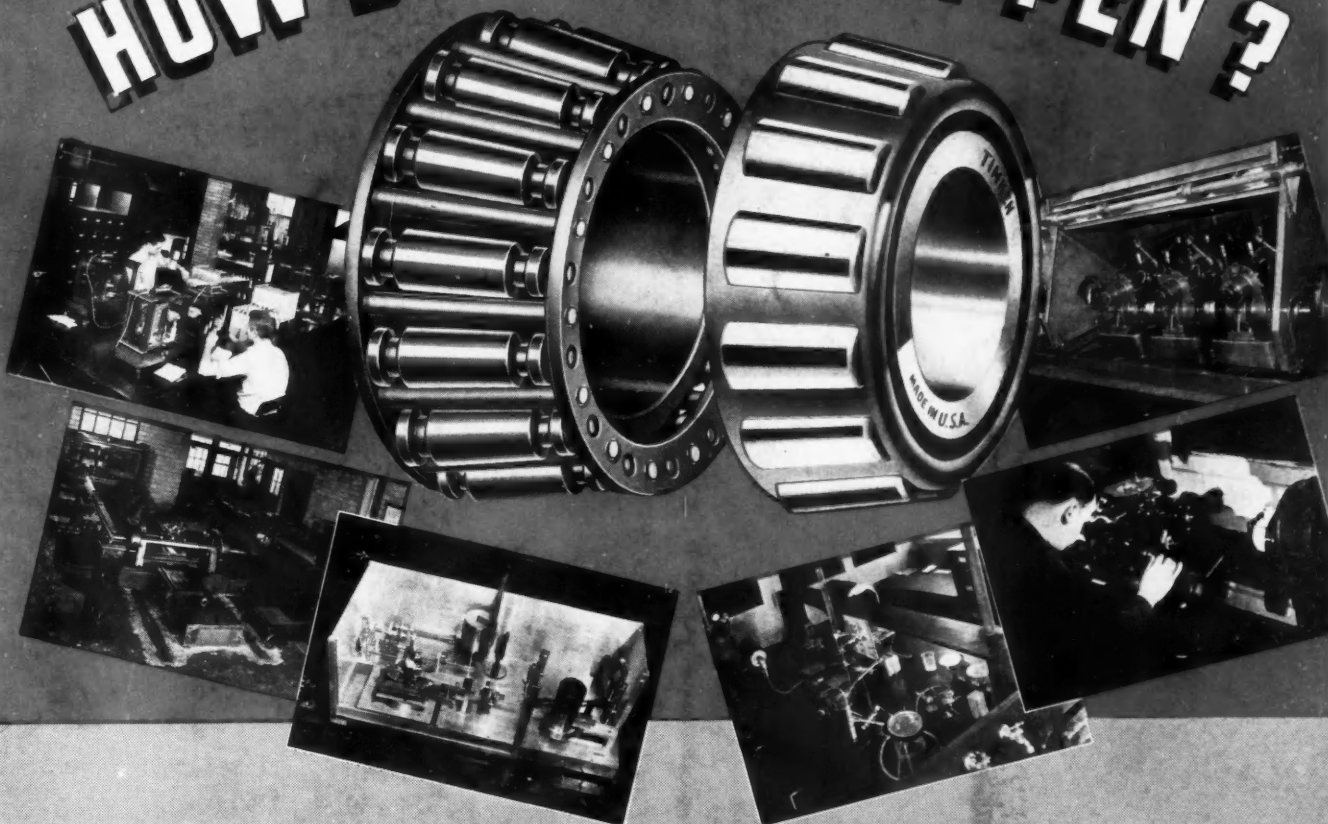
# AUTOMOTIVE INDUSTRIES

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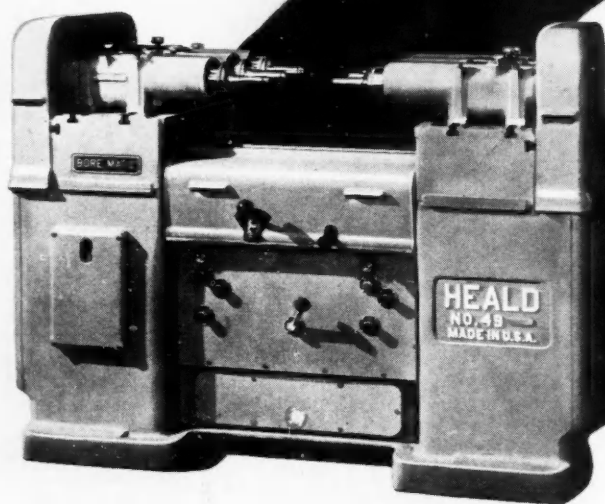
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# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

Reg. U. S. Pat. Off.  
Published Semi-Monthly

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November 15, 1940

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# IN THIS ISSUE . . .

## AUTOMOTIVE INDUSTRIES

Reg. U. S. Pat. Off.

Volume 83 November 15, 1940 Number 10

### COTTON

The crop from 1,890,000 acres will be required to fill the orders for cotton being placed by the automotive industry for 1941, according to a compilation of statistics released by the Cotton-Textile Institute. A total of 945,000 bales of cotton, about 460,000,000 lb., will be used, with individual models consuming between 51.4 and 80.9 lb. of raw cotton, depending on details of design and manufacture.

Upholstery, cord and fabric for tires, top materials, artificial leather, plastics, lacquers and mechanical rubber goods such as radiator, heater and brake hoses are the principal items which contain cotton or use cotton in their manufacture. Additional minor uses include gaskets and washers, silent timing gears and insulation.

Many yards of specially processed cotton fabric are used to upholster seats, sides and top. Soft cotton blankets cover the seat springs. The sides and top are cotton-padded and cotton covers the floor boards and helps soundproof the car.

Cotton "linters," the fuzz from cotton seeds, supply the pure cellulose which is the base of certain plastics used in the car as well as the lacquer which protects and beautifies its metal surfaces. It is reliably estimated that 2,000,000 lb. of linters will be used in the manufacture of automobile lacquers this year in addition to the millions of pounds which will be converted into steering wheels, instrument panels, controls, switches, knobs and buttons, garnish moldings and similar parts.

An average of about 5½ lb. of raw cotton goes into every tire and during 1939, tire manufacturers used 316,870,000 lb. of cotton as cord and fabric for the 57,612,000 truck, bus and passenger car tires produced.

The progressive leadership of the cotton-textile industry is reflected by one mill's research which has recently led to the development of a process of manufacturing heat-resistant cotton cord for tires. This new cord is said to have stepped up the performance of tires to higher levels. The same heat-resistant cord also has found application in power transmission belts and in hydraulic brake hose.

*Automotive Industries*

### GENERAL

#### Back to Business—Government Business

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The preparedness program is presenting many new problems and stumbling blocks to the industrial organizations. In this article the author has pointed out some of the points on which those working on Government orders should inform themselves.

### AERO DESIGN

#### Aircraft Engineers Convene

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The annual aircraft meeting of the S.A.E. was held in Los Angeles and out of this meeting comes some brand new ideas in aircraft design.

### NEW DEVELOPMENTS

#### Glass-Insulated Magnet Wire

536

The electrical parts of the automobile have seen many improvements. Likewise the use of glass for purposes other than windows has gone into many new places. In this article P. M. Heldt has treated the subject of glass insulation for wiring. It is being used and it will likely be used more and more. Here is an opportunity to inform yourself.

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November 15, 1940



## Airplane View of the Principal Plant of Inland Steel Company

This aerial photograph, taken at an altitude of 1,000 feet, shows the Indiana Harbor Works, on the south shore of Lake Michigan. The No. 1 unit, and the administration building, are in the foreground. Across the tracks is the No. 2 unit, with the 76-in. and the new 44-in. continuous sheet and strip mills at the right. The capacity of this modern plant has been increased 40 per cent in the last eight years.

# AUTOMOTIVE INDUSTRIES

Published on the 1st  
and 15th of the month

Vol. 83, No. 10  
November 15, 1940

## Back to Business ...Government Business

*The role of the automotive industries in the national defense program will be expanded rapidly in the next few months. Many plants need knowledge of contractual procedures involved*

**I**NDUSTRY has already undertaken its phase of the national defense program with an inspiring alacrity despite the hazards involved in government contracts. Many of the headlined "orgies of profits" turned out to be losses following the last World War because manufacturers failed to recognize the difference between commercial business procedure and government contracts for war supplies and materials.

Even cost-plus contracts<sup>1</sup> can conceivably result as cost-minus manufacturing ventures.

The facts today are:

1. Many companies now negotiating for government contracts were not in business in 1918.
2. Few of the manufacturing executives who are now negotiating contracts with the Government were playing similar roles nearly a quarter of a century ago. Obviously, the present executives in these negotiations cannot anticipate the many pitfalls

**"LET'S go to work"** is a blunt, Anglo-Saxon phrase which will provide balm for millions of Americans following the national election. The biggest job we have to do as a nation is to build a wall of mobile steel around a large portion of the western hemisphere. With the technical problems involved, go accounting and legal problems. You may find a sentence or two in this article which will help your thinking in the latter direction.

ahead, although most of them are certainly conscious of the fact that a government contract for manufacturing products they have never made before is not going to be a bed of industrial roses.

3. Sitting opposite these newcomers in government-industry negotiations are old hands representing the Government.

4. There are new laws, some still in force as written, some modified, and still others in the process of legislation. Some of these set limits on profits, and recapture all profit in excess of statutory allowances.

5. Costs must be audited by the Government.

6. Manufacturing specifications under government contracts are rigid, and usually far more severe than commercial requirements.

7. There are income and excess profit taxes.

8. In many cases, new facilities will be required. Not necessarily buildings, but new machine tools, jigs, dies, fixtures, testing and inspection equipment and special equipment required for particular types of products.

All this means that extreme caution must be exercised by every prime-contractor and every sub-contractor if the companies supplying war material are to be in the black instead of the red at the end of the fiscal year.

Generally speaking, there are two types of war order contracts:

1. Fixed-price contract. This falls into

<sup>1</sup> Cost-plus contracts are again permitted as they were during World War I, but the fee or profit cannot be computed a percentage of the cost. It must be a "fixed" fee—fixed when the contract is signed.



two types, the "bid type" and the "negotiated type."

## 2. Cost-plus-fixed-fee contract.

These types of war order contracts are in turn affected by various laws now in effect, such as the Vinson-Trammell Act of 1934 (and its numerous amendments) which now limits profits to 8 per cent of the selling price, or 8.7 per cent of the cost—whichever is the lower figure.

The above pertains to the prime-contractor. But what of the sub-contractors? Many manufacturers are today taking sub-contracts without realizing that they *are* sub-contractors under government prime-contracts and are subject to the laws and regulations governing the latter. The presidents or general managers of six of seven companies interviewed by AUTOMOTIVE INDUSTRIES said that they did not believe they were sub-contractors at all. They were, they said, simply manufacturing parts for a government contractor. Two later reported that they had discovered, upon investigation of the point raised, that they *were* sub-contractors and are busily looking up the laws and regulations covering sub-contractors. In other words, sometimes a parts maker is a sub-contractor and in other cases he is not. This point should be investigated, however, early in any negotiation with a prime contractor.

What are costs?

A good many of the every-day commercial items of cost are acceptable as government costs. But many will not be permitted, either in the primary stage of reporting on contract estimates, in the contracts themselves, or in any subsequent claims or litigation.

For example, normal commercial procedure includes in total costs all manufacturing and distribution expenses. It is in respect to the latter that the war contractor finds himself holding the so-called "non-allowable expense" bag. Sales offices, personnel, sales operating expenses, advertising, dealer aids, direct mail, samples, and other items involved in promoting the sale of merchandise do not constitute allowable costs under government contracts. Suppose a company is doing 25 per cent of its business with the

Government, and 75 per cent through commercial channels? The whole cost of promotion and distribution must fall upon the 75 per cent.

These distribution costs incurred over the years have helped to build up the company's production to a point where it can undertake to manufacture things for the Government. They have helped to make the profits out of which additional plants, new manufacturing machinery, and well-trained personnel have been added to the company's manufacturing facilities. Through sales efforts, and the resulting increased sales and profits, research and development work have been expanded. Yet this company is penalized for this sales effort in terms of government contracts because no part of these current expenditures are allowable in determining costs.

Therefore, the question of costs, in either the fixed-priced type or the cost-plus-fixed-fee type of contract, requires very serious thinking on the part of the thousands of manufacturers who will be asked to participate in the present government rearmament program.

The record of industrial expansion during the last war shows clearly that many companies underestimated costs. Unless a manufacturer is unusually well acquainted with the rigid government specifications, he faces trouble. He must know the requirements for material; he must know what is expected in heat-treatments; he must be sure he can produce the tolerances and finishes called for; he must study carefully the

need for additional machine tools and manufacturing equipment, jigs, dies, and fixtures; and he must realize the hazards of the very severe inspection.

To make sure of these points, he should call upon the prime-contractor for the fullest possible cooperation, if he is a sub-contractor.

An item which foundered many an able and long-established manufacturer during the last war was rejects. The government inspector has nothing to gain but everything to lose if he passes sub-standard parts. He is compelled by departmental regulation and requirements to be super-critical. The manu- (Turn to page 564)

## The Brass Hat-Rack

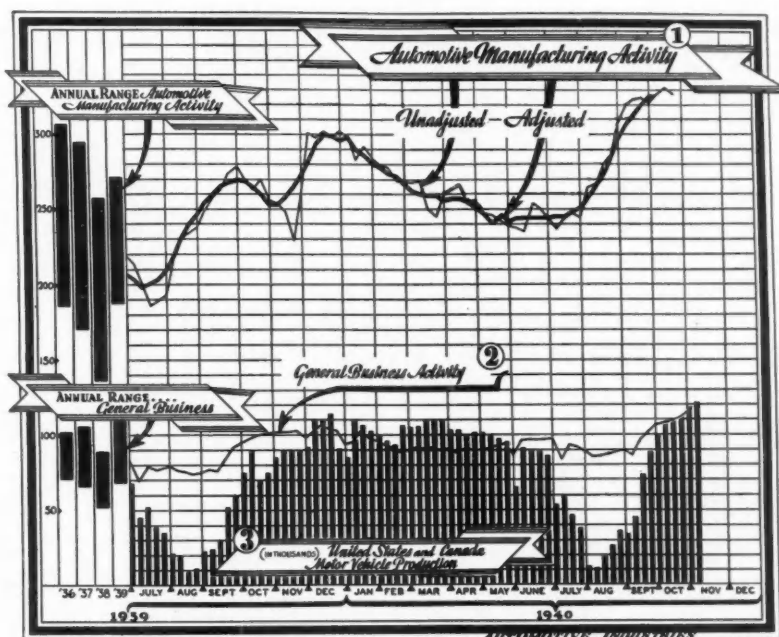


"Mr. Whiffle says he won't let the government take over his business without a fight!"

B. Brown.

# BUSINESS IN BRIEF

*Our own view of automotive production and sales;  
authoritative interpretation of general conditions*



**Weekly indexes of automotive general business  
charted**

## Production Peak is Three-year Record

**P**EAK production in the automobile industry for 1940 was attained in the early part of November and if the same pace is maintained throughout the month, a record-breaking November to follow a new high for October was forecast. The first 15 days of the month saw an output of approximately 263,000 motor cars and trucks. Even with an expected decline for the latter part of the month and the interruption of the Thanksgiving holiday, a total production in excess of

450,000 units was anticipated. This would eclipse the best previous November, in 1935, when 408,550 vehicles were manufactured, by a substantial margin.

A new three-year high for a single week's production was attained in the week ending Nov. 9 when an estimated 121,000 units were produced. This was a gain of more than 3000 units over the previous week and probably marked the peak of the fall production season, which saw 519,700 vehicles turned out in October, according to A. M. A. estimate. It was the highest single week's output since June, 1937.

General Motors turned out 51,400 units during the record-breaking week, with Pontiac working a six-day week and Buick employing overtime shifts. All GM motor car divisions experienced the best single month's production during October since 1937. Ford stepped output up to 25,500 units for the week, reaching a rate of 5300 per day for Ford and Mercury cars.

Chrysler manufactured an estimated 27,400 motor cars and trucks, continuing the high rate which saw Plymouth manufacture 63,000 units during October,

<sup>1</sup>1923 average = 100; <sup>2</sup>Prepared by Administrative and Research Corp. New York. 1926 = 100; <sup>3</sup>Estimated at the Detroit office of AUTOMOTIVE INDUSTRIES.

an all-time high for a single month, and the Chrysler division had the biggest month since August, 1929. Several of the independents like Studebaker and Hudson trimmed their production schedules after operating at near-capacity during October, but Nash, Packard and Willys, which were later getting into assembly of 1941 models, upped their output slightly.

With more than seven weeks of the year left, 1940 production passed the entire total for

1939 during the week ending Nov. 9. The total was 3,732,374 motor cars and trucks. Before the end of November, 1940, production should pass 4,000,000.

Retail sales followed production in setting a record pace during October. Pontiac sales of 27,217 vehicles were the highest for a single month in Pontiac history, surpassing the previous October by 62 per cent. Buick likewise had the largest month on record with retail deliveries of 33,471 cars, bettering the previous record of 31,028 set in August, 1927. Plymouth sales of 43,000 vehicles constituted the best October in the division's history, exceeding October, 1939, by 20 per cent. Oldsmobile gained 38 per cent over 1939.

Completion of the first draft lottery was expected to boost used car sales and firm the market. Many used car buyers are of draft age, but now that they know their numbers and when they will be called, they can plan for the future and govern their buying.

New passenger car registrations for the first nine months of 1940 totaled 2,489,091, a gain of 27 per cent over the similar period of 1939, according to R. L. Polk & Co. New truck registrations were 430,235 for the nine months, an increase of 16 per cent.

# Aircraft

**T**HE S.A.E. annual aircraft production meeting was held at the Biltmore Hotel in Los Angeles from Oct. 31 to Nov. 2, inclusive. On the first and second days there were morning, afternoon and evening sessions, but on the closing day the afternoon was taken off to attend a football game and in the evening the annual banquet combined with "grand ball" was held.

The program was a very interesting one, but it hardly justified the designation "production meeting," as only one of the six technical sessions was devoted to strictly production problems. It does not seem practical to limit the western meeting to production topics, for a large part of the industry is located on the West Coast. The majority of aircraft engineers in that section of the country for many years to come will be interested mainly in research, design and operation, and it is more than likely that papers on subjects under these headings will continue to preponderate at the meeting.

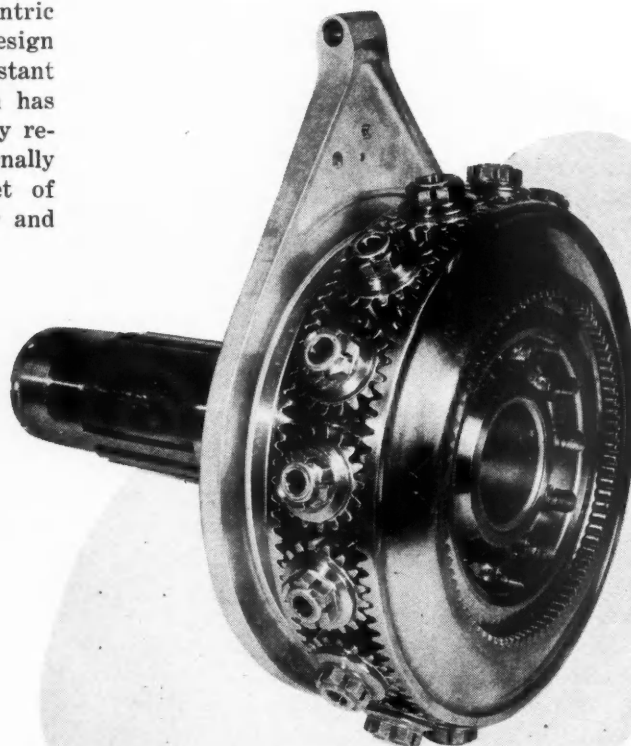
Following are abstracts of the more important papers, from preprints issued of these papers:

## **Reduction Gears and Torque Meters**

**R**OLAND CHILTON, consulting engineer to Wright Aeronautical Corporation, presented a paper on Aircraft-Engine Reduction Gears and Torque Meters. For radial engines planetary gears giving a concentric drive are almost universal. Difficulties in the design of such gears are encountered because of the constant increase in the power to be transmitted, which has now reached 2000 hp. The conventional planetary reduction gear consists of a sun gear, an internally toothed ring gear coaxial therewith, and a set of planetary pinions supported by a pinion carrier and meshing with both the sun gear and the ring gear. Two different reduction ratios can be obtained from such a combination, by either anchoring the ring gear and using the sun gear as the driver, or anchoring the sun gear and using the ring gear as the driver, the planetary carrier being the driven member in either case. With the ring gear anchored it is impossible to get a reduction ratio as low as 2, but by using planetary pinions of the smallest possible size (and the largest number for which there is room, in order to secure the necessary capacity), this ratio can be approached. With the sun gear anchored the reduction ratio will be lower.

Wright Aeronautical Corporation has developed such a reduction gear with interchangeable ratios of 16:7 and 16:9. The planetary pinions have pitch diameters of only  $1\frac{3}{8}$  in. and run at over 8000 r.p.m. But by using twenty of them—the greatest number it is possible to get in—a capacity of 2000 hp. is obtained, each pinion carrying a load of 100 hp. When the sun gear is the driving member the tooth loading naturally is greater, because the maximum torque is the same in both cases and the pitch diameter of the sun gear is smaller. However, the author stated that the transmission had been endurance-tested with the sun gear acting as driver, at 2000 hp.

At first some trouble was encountered with pinion bushings, which in continuous operation under 2000 hp. would seize, causing heat cracks in the pinions and complete gear failure. To eliminate such failures it was necessary to distribute the load uniformly between the planetaries, which called for close tolerances in tooth and pinion-arm spacings. The multi-pinion design gives relatively flexible rings and pinions,

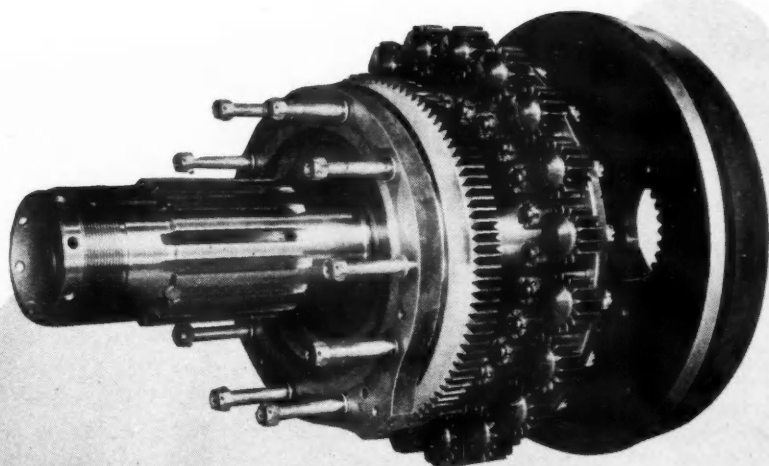


*Wright multi-pinion bevel-gear type of planetary for reverse rotation and 2:1 gear reduction. (An early design.)*



# Engineers Convene

*in Los Angeles at the Annual Aircraft Production Meeting of the SAE*

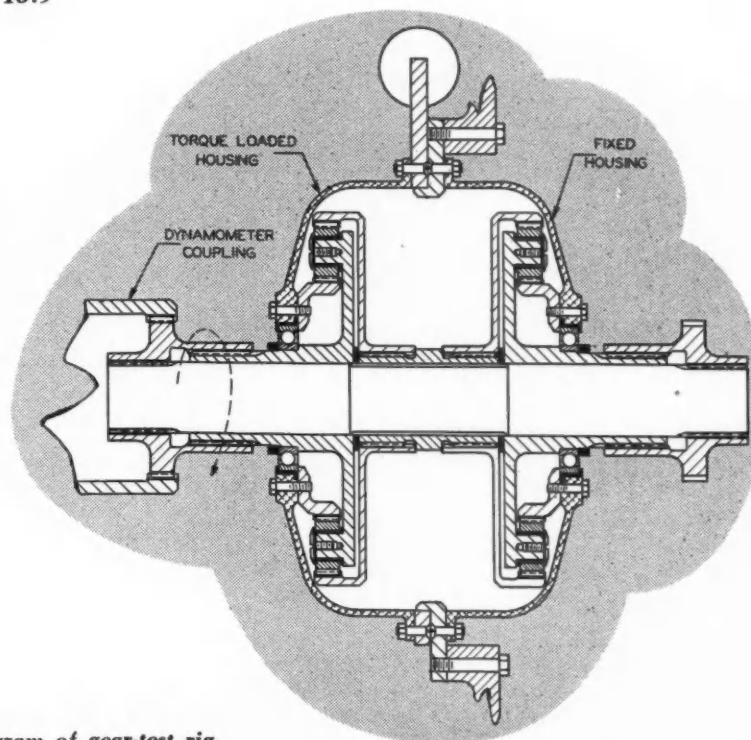


*Wright multi-pinion spur-type reduction gear giving interchangeable ratios of 16:7 and 16:9*

compensate for the lesser stiffness of the thin ring-gear rim, the latter is provided with a heavy flange at its outboard end, which stiffens that end against radial deflections, and the web of the sun gear is offset to stiffen the outboard end of the teeth. Tests of the reduction gear in a dynamometer which measures the input and the frictional loss (rather than the input and output)

when the ring thicknesses are made as light as consistent with conservative stresses. In producing the Wright reduction gear, cumulative tooth errors are held to 0.0001 in., while the tolerance on pinion-journal bearing spacings is 0.0005 in. between adjacent journals and 0.001 in. between any. The bushing thickness also is held to close tolerances.

To facilitate accurate spacing, the trunnions are made integral with the carrier ring. They constitute cantilevers subject to deflections which are calculated to attain 0.0002 in. in the length of the tooth. This deflection would tend to overload the inboard end of the teeth if the sun and ring-gear rims had uniform stiffness. To



*Diagram of gear-test rig*

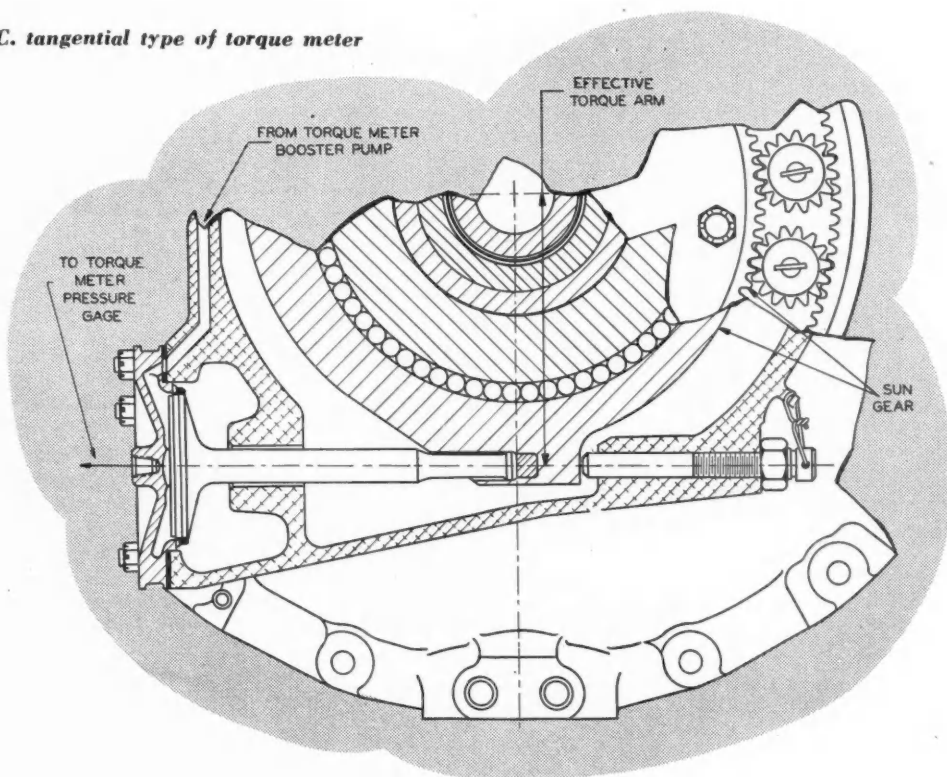
### W.A.C. tangential type of torque meter

showed an efficiency of 99.1 per cent. Neglecting the weight of the propeller shaft—which is required also for a direct-drive engine—the reduction gear weighs only 51 lb.

The floating bushings of the planetary pinions are lubricated under pressure, oil being circulated at the rate of 20 lb. per min. In the early tests, pitting of the teeth occurred. Experiments with stress pick-ups indicated high stress-cycles of tooth-contact frequency in the stationary gear rim. This was attributed to oil being trapped within the ring gear, and was reduced to about one-tenth by drilling large drain holes in the cylindrical part of the gear. As the time required for a tooth to fully enter a tooth space is only  $1/2000$  sec., good drainage is necessary if overloading due to hydrodynamic action is to be avoided.

Improvements were made also in the floating bushings of the planetaries, which are now made in two parts. Each part has a flange at one end and a circumferential oil passage is provided at the middle.

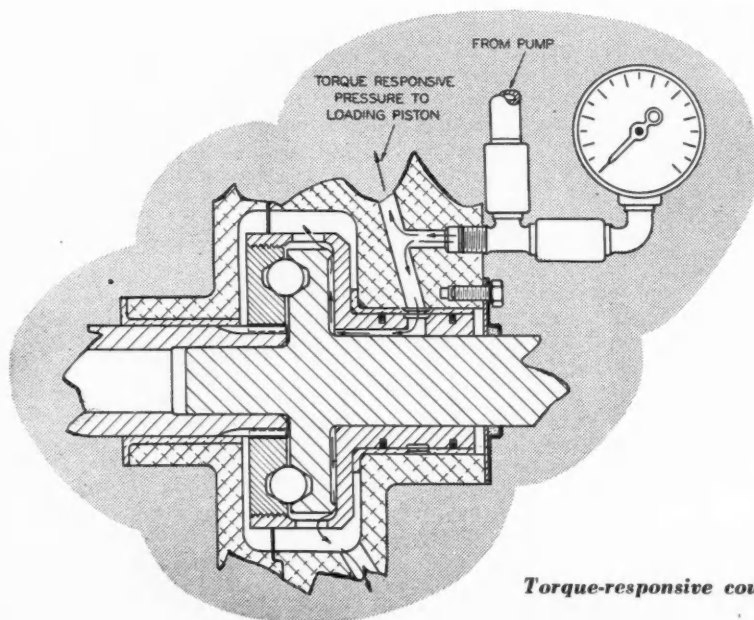
The reason for bracketing reduction gears and torque meters in one paper is that the torque meter is combined with the anchored member of the reduc-



tion gear. This member takes the torque reaction, and by cushioning the anchored member hydraulically and measuring the hydraulic pressure by means of a pressure gage, the torque can be readily determined. The measuring cell is of the flow type, taking the entire delivery of a small oil pump. As the pressure due to pump action rises a port opens and allows oil to escape. The port automatically will open sufficiently to maintain the pressure in the measuring cell at the right value to balance the torque transmitted from the engine to the propeller.

### Electrical Installations On Air Liners

**P.** C. SANDRETTO of United Airlines Transport Corporation presented a paper dealing with electrical installations on board aircraft. He said air lines are interested in electrical systems from three points of view—those of troubles, weight, and facilities. Troubles with electrical systems center largely around the regulator. According to the author, the vibrating-contact type of voltage regulator, which has seen extensive use in the past, suffers continually from contact points which either “freeze” or fail to make good contact. High-current, low-voltage contacts mounted on a vibrating structure are certainly the best definition of trouble that any electrical engineer can conceive, said the author.



Torque-responsive coupling

Mr. Sandretto dealt at some length with the electrical system of the Douglas DC-3, but said that aside from the facilities afforded by the storage battery, it was troublesome, heavy, and inflexible. When the Douglas DC-4, a four-engined plane, makes its appearance on the commercial airways of the United States, sometime during the spring of 1941, it will have provisional gross weight of 55,000 lb. and will carry 40 passengers and a crew of 5. It has many more electrical units than the 28 listed for the DC-3. For example, 11 radio units will replace the 4 used on the DC-3 and the total of its electrical loads amounts to about 15 kw. For power, it will use four 24-volt generators operated in parallel, each having a power capacity of 3 kw. A single 24-volt, 65-amp.-hr. battery is used to start the engines and supply radio from the time of loading of the plane to the time of its take-off. Generators are designed to operate from the main engine with a three-to-one gear ratio.

The reasons for the selection of a higher voltage than 12 were that the weight of plane wiring with the higher voltage is much lower, that military interests had begun using this voltage and certain 24-volt apparatus had become available, and that Radio-Technical Subcommittee No. 3 on power supplies had adopted this voltage as standard in 1938.

In designing the generators for the DC-4, an attempt was made to provide a regulator free from trouble. The regulator employs a voltage-sensitive element which actuates a motor-driven field rheostat. Thus the

sensitive element does not have to do any work and should be more trouble-free. A small selenium rectifier is used as an element sensitive to reverse current and actuates a large relay which stops reverse current flow. The current limiter is eliminated. A distributed field winding in the generator supplies regulation for current changes of reasonable magnitude.

### **Stainless Steel in Aircraft**

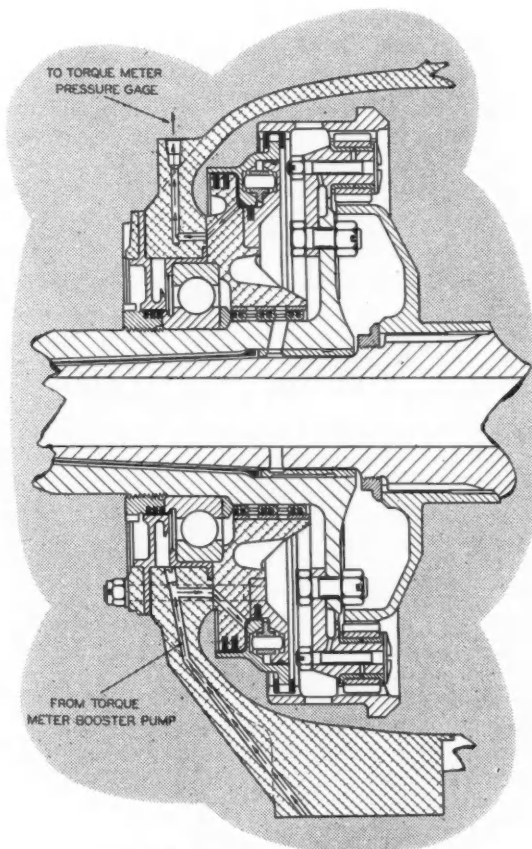
**A**N INTERESTING paper on Some Uses of Stainless Steel in Aircraft was presented by Oliver Fraser, Jr., aeronautical sales engineer of Carnegie-Illinois Steel Corporation. Mr. Fraser said the present urgent demand for aircraft permits producing companies to go into the market for tons of stainless steel, where previously their requirements were for a few sheets. Several types of stabilized austenitic stainless steel have been placed in production to meet the need for carbon fixation, and other variations in the specifications have been introduced to improve certain other properties. This confronted the steel industry with serious inventory problems.

While official reports credit the steel industry with operating at 95 per cent capacity, actually it is working at the peak of its equipment's ability, the remaining 5 per cent of the time being required to repair the hard-pushed machinery. If the aircraft engineers could make it possible to eliminate even one, but preferably a number of the steels now called for, it would be possible to keep aircraft steels out of inventory and moving through the plants and out to the aircraft factories at the lowest cost with the least time loss.

While the steel industry will produce any alloy that may be called for, some of the stabilized alloys are inherently less expensive to produce. For instance, the 18-8 alloy stabilized with titanium is about 4 cents per lb. cheaper than that stabilized with columbium, yet comparative tests show practically no difference between the two alloys. Certain customers say, however, that the titanium alloy works much better in their fabricating processes. The author made the suggestion that aircraft engineers study test results on all alloys before placing their orders, as that would enable them to eliminate unnecessary expense. At any rate, he hoped it would be possible to reduce the number of alloys called for.

A second consideration concerns the factors of temper, size, tolerance, workability, flatness and finish. These are so interrelated that it is necessary to consider them simultaneously. It was suggested that aircraft engineers specify the use to which the material will be put and the worst operation which it will be required to withstand; alternately, that they permit a study of their requirements by the steel company's engineers, and that they would then be furnished the best steel for the intended purpose.

The author went into the design of wing and fuselage structures of stainless steel at considerable length. In this discussion he did not make any mention of physical properties. This, he said, was deliberate, as the physical properties of the steels which will be furnished are included in Government specifications. Other physical properties are possible, but the question must



**W.A.C. 20-pinion reduction gear with concentric torque meter**



be taken up with the steel mills before the order is placed. Most any tensile strength can be furnished, from approximately 80,000 lb. per sq. in. for non-stretcher-leveled, annealed sheets and 100,000 lb. per sq. in. for leveled annealed sheets to 185,000 lb. per sq. in. for cold-rolled sheets.

One reason physical properties were not given in the paper, the author said, was that the industry has in progress at the National Bureau of Standards a joint research project on precise and commercially obtainable physical properties of stainless steels. This investigation, among other things, is to determine the compression modulus of such steels. When these results are ready for publication they will be given wide publicity. Any suggestions from aircraft manufacturers regarding investigations that might be included in the project would be appreciated.

### **Electric Auxiliary Power-plants for Large Planes**

**A**UXILIARY POWER EQUIPMENT was the title of a paper by C. C. Shangraw of Eclipse Aviation, the author outlining the various stages of development which have been passed through during the past few years. There have been developed 115-volt, 800-cycle, single-phase and 115-volt, 400-cycle, three-phase systems, but the latter has not yet been service-tested, hence no direct comparison is possible. At the present time the trend is toward a 24-volt direct-current system, and high-speed, light-weight, high-output, main-engine-driven generators have been developed. These generators can be operated in parallel with each other, as well as with 24-volt, direct-current auxiliary power-plants. For the planes of today these generators were said to be preferable to high-voltage alternating-current systems. Gear boxes were also suggested as a means of driving cabin superchargers and various other accessories, thus permitting the installation on the main engine to be simplified.

### **Magnesium in Engines and Aircraft**

**D**OMESTIC production of magnesium doubled during the past year, and early next year it will again be doubled, said John C. Mathes of the Dow Chemical Company in a paper on Magnesium Alloys in the Aircraft Industry. The aircraft industry has been a major factor in stimulating the demand to the point where a four-fold expansion was called for in little more than a year; not only has production of aircraft greatly increased, but more magnesium is used per plane built.

Magnesium is used most extensively in the engine, and following are lists of the principal parts made of this metal in three types of aircraft engine:

Large radial engines: Front supercharger housing, front crankcase section, rear supercharger housing, rear supercharger cover, rear section or accessory housing.

Medium radial engines: Thrust-bearing housing, accessory housing, starter-drive housing, oil sump, carburetor air intake, rear section of split crankcase.

In-line engines: Supercharger drive housing, accessory housing, intake manifolds, oil-pump body, camshaft housing, camshaft cover, rear crankcase.

Wheel assemblies are the principal parts of the plane itself that are made of magnesium. Wheel castings as heavy as 160 lb. are not uncommon, and the average weight of such wheel assemblies on planes of large production is between 55 and 60 lb. Wheel castings still account for the largest tonnage of magnesium used in plane construction, but in addition the following miscellaneous parts are frequently made of this light metal: bellcranks, window frames, camera and equipment mounts, mechanism housings, levers and supports, air-intake scoops, landing-gear and control-system parts.

Recently the use of magnesium alloys for the entire airplane structure has been considered, and test wing panels are now being built for the military services. Some difficulties are anticipated, but wings built of this material offer definite advantages, and it is believed that the results of the tests will stimulate interest. The work done to date indicates that magnesium alloys may be used in aircraft structural members to save weight, to save cost and to increase aerodynamic efficiency, particularly in high-speed planes. The bases for this belief were discussed at some length in the paper.

### **Vapor Lock in Aircraft Systems**

**C.** BRIDGMAN, director of the CFR aviation vapor-lock projects, reported on progress made with these projects. An investigation of pressure drops in component parts of the fuel system has been substantially completed, but the data obtained are still to be analyzed and engineering tables are to be prepared therefrom. Facilities will be maintained for testing new or modified designs of fittings and accessories under comparable test conditions, at nominal cost to the manufacturer.

The future program on vapor lock of the CFR Committee includes an extension of the use of the pressure drop data obtained to other fluids of higher viscosity, such as hydraulic oils, and the selection of a standard calibrating fluid of low fire hazard; development of a standardized test procedure for gasoline flow and pressure drops in fuel-system mock-ups; development of a standardized test procedure for fuel-system performance during flight; assistance in the development of fuel-system fittings and accessories of low pressure drop, and assistance in the development of more satisfactory fuel-pump installations.

In the course of the investigation it was found that fuel-pump installations are responsible for much of the vapor-lock difficulty encountered in airplane fuel systems. In conventional installations, the fuel is drawn by suction from the tank to the engine-mounted pump, with resultant tendency toward vapor formation in the fuel system as the result of high pressure drops. This situation is still further aggravated by the fact that the pump has excess capacity, with the result that the excess fuel is by-passed back around the pump from a high-pressure to a low-pressure area, and still more

vapor is released. The net effect is that the pump efficiency falls off very rapidly as vapor-locking conditions are approached, and soon reaches a state where it will not supply sufficient fuel for the engine. The theoretical answer is very simple, namely to push the fuel and not pull it by suction up to the engine, and secondly, to eliminate the by-pass around the fuel pump.

Recent trends have been toward a compromise solution, involving the use of a booster pump located near the tank selector valve and incorporating a vapor eliminator. This still leaves the problem of getting boiling fuel out of the tank and through the selector valve by suction, but does eliminate the effect of suction pull throughout most of the fuel system and does reduce the pressure differential across the by-pass valve around the engine-driven pump.

### Standardization of Engine Components

**I**N A PAPER on Standardization of Aircraft Engine Components, Gustaf Carvelli of Wright Aeronautical Corporation pointed out that of the present standard propeller-shaft ends, five have straight-sided splines, while the sixth has involute splines, and he suggested that if any new standards were adopted, possibly for larger shaft ends, they should be of the involute type, because it is better adapted to large production, lends itself to greater accuracy than the straight-sided type, and because the involute type with a full radius at the root has a lower stress-concentration factor than the straight-sided type.

For securing gears to driving shafts, use has been made successively of keys, straight-sided splines, 20-deg. involute splines, and 30-deg. involute splines. The advantage of the last-mentioned over the others is shown by Fig. 1. Included in the specifications of the involute spline is what is known as the true-involute-form diameter. On the external spline the involute form must be true outside, and on the internal spline, inside this diameter. This 30-deg. involute spline is used in the following standardized drives:

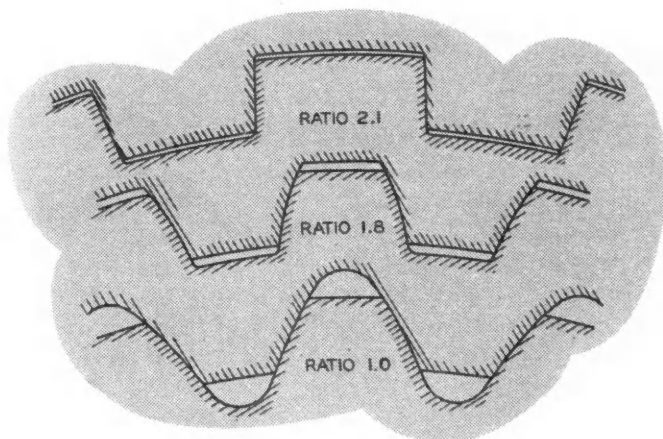


Fig. 1. Giving stress-concentration factors for splined fittings with straight-sided, 20-deg. involute with small fillet and 30-deg. involute with full-radius splines

generator, accessory-gear-box, fuel-pump, propeller-governor, vacuum-pump and the No. 60 propeller-shaft end.

For screws and bolts holding together highly stressed parts subjected to repetitive loads the National Screw Thread form has been found unsatis-

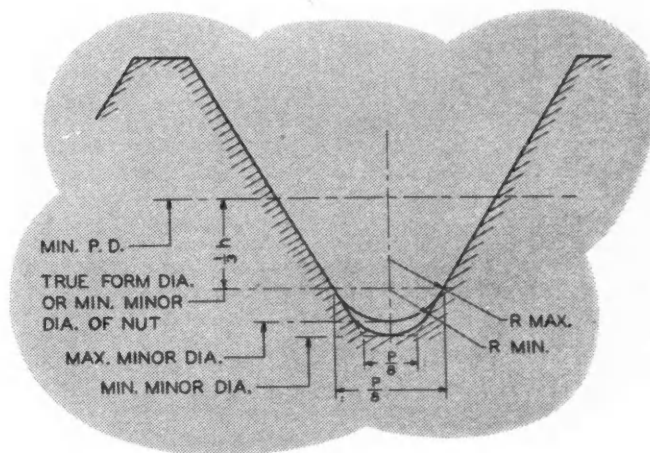


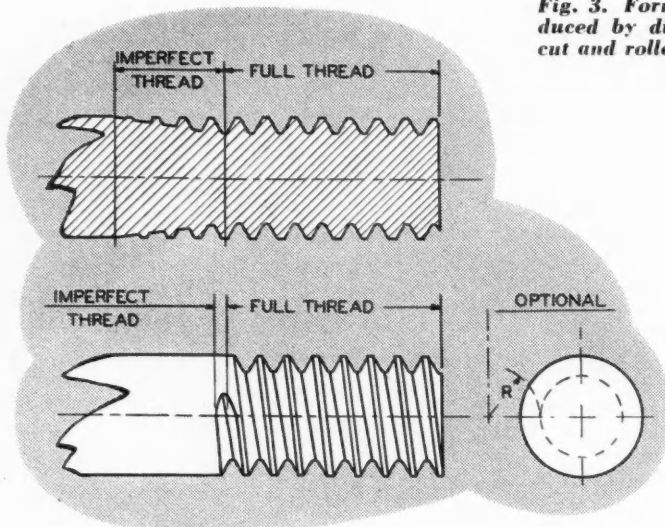
Fig. 2. Modified screw thread with rounded top and bottom

factory, and the modified form of thread illustrated in Fig. 2 is used. Instead of allowing sharp corners at the top and bottom of the thread, minimum and maximum radii are specified. The maximum radius  $R$  varies from 0.0018 in. for 80 threads per inch to 0.03608 in. for four threads per inch. The minimum value of  $R$  varies according to whether the thread is ground, rolled or milled, or die-cut. For die-cut threads the minimum acceptable radius is 0.001 in. regardless of the pitch of the thread; for ground threads (of 36 or less pitch) it is 0.003 in. regardless of the pitch, while for rolled or milled threads it varies with the pitch. The minimum radius is the radius formed by the side of the thread and the minimum minor diameter, while the maximum radius is controlled by the sides forming a tangent at  $P$ , with a radius. This thread form has proven its usefulness for tapped holes in aluminum or magnesium, as well as for studs and bolts.

The National Screw Standard Class 2 and 3 does not allow for a neutral zone, the low limit of the pitch diameter for the nut being the high limit for the screw. Nuts assembled with a size-to-size fit on the pitch diameter will seize. Many cases are on record where the stud pulled out with a nut when the engine was disassembled, or where it was necessary to cut off a bolt in order to remove the nut. To facilitate the assembling of nuts, bolts and screws, a neutral zone (difference between minimum nut and maximum bolt pitch diameter), has been adopted, which varies with the thread diameter as follows: Up to  $1\frac{1}{4}$  in., 0.0005 in.;  $1\frac{1}{4}$  to 2 in., 0.0010 in.; 2 to 3 in., 0.0015 in.; 3 in. and over, 0.0020 in.

It is often important to control the location of the end thread. Fig. 3 shows two types of threads. When

Fig. 3. Form of run-out for threads produced by different processes. Top: Die-cut and rolled thread; bottom, milled and ground thread



threads are milled or ground, the end thread is as shown in the lower view; when die-cut or rolled threads are required, the threads are as shown in the upper view. It is necessary to have a definite understanding of what is a full or imperfect thread, and the drawing helps to make this clear.

Studs are commonly used to hold aircraft-engine parts together. Cap screws would not be satisfactory, because the threads in the aluminum or magnesium would strip or wear during the many assemblies and disassemblies in the life of the engine. The stepped stud, Fig. 4, has proven the most satisfactory. Short studs are made of the X type, while longer

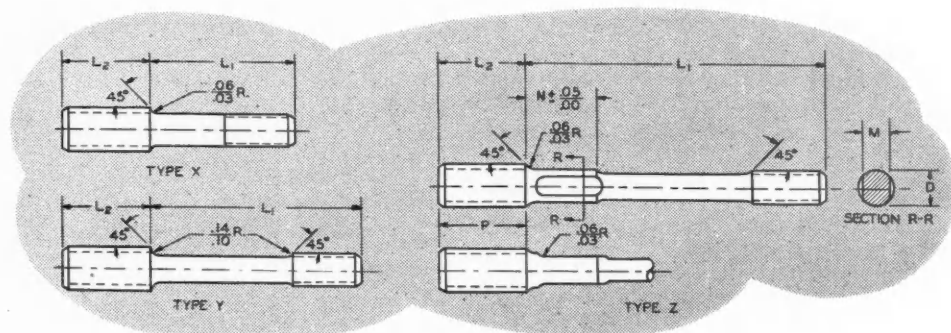
studs are necked to eliminate fatigue failure. Long studs must have a flat at the stud end (Type Z), to avoid overstressing the necked portion when assembling the studs. A coarse thread on the stud end, and that end 1/16 in. larger in diameter than the nut end, has proven satisfactory.

Many gears are used in aircraft engines. The 20-deg. full-depth tooth form has proven the most satisfactory. However, the standard 20-deg. tooth form has high stress concentration at the root, as the fillet has a radius of only a few thousandths of an inch. By using a 20-deg. tooth form with a full radius at the root, the stress concentration will be considerably decreased (Fig. 5).

### Protecting Aircraft-Engine Ignition Wiring

A SYSTEM which is claimed to prevent injury to aircraft ignition systems by corona or by chemically active or conducting gases and liquids which tend to enter the "shielded" ignition system during flight was described by Carl E. Swanson, electrical engineer, Northwest Airlines, Inc., in a paper on Supercharged Aircraft Ignition Harnesses. The system consists in forcing clean dry air under pressure through the conduits constituted by the shielding. It is claimed that the presence of super-atmospheric pressure within the harness will prevent injurious sub-

Fig. 4. Standard studs for aircraft-engine use



DIMENSIONS OF STANDARDIZED STUDS FOR AIRCRAFT ENGINES

Nut End	Stud End	L <sup>2</sup>		d	M	N	P		L <sup>1</sup>		
		2 Dia.	1.5 Dia.				2 Dia.	1.5 Dia.	Type X	Type Y	Type Z
.250-28	.313-18	.60	.45	.250	.20	.60	.65-.70	.50-.55	Up to 2.00 Incl.	Do Not Use	Do Not Use
.313-24	.375-16	.75	.55	.313	.25	.60	.80-.85	.60-.65	Up to 2.50 Incl.	Do Not Use	2.55 and Up
.375-24	.438-14	.90	.65	.375	.31	.60	.95-1.00	.70-.75	Up to .75 Incl.	.80 to 2.00 Incl.	2.05 and Up
.438-20	.500-13	1.00	.75	.438	.36	.60	1.05-1.10	.80-.85	Up to .85 Incl.	.90 to 2.50 Incl.	2.55 and Up
.500-20	.563-12	1.10	.85	.500	.42	.75	1.15-1.20	.90-.95	Up to .95 Incl.	1.00 to 3.00 Incl.	3.05 and Up
.563-18	.625-11	1.25	.95	.563	.47	.75	1.30-1.35	1.00-1.05	Up to 1.05 Incl.	1.10 to 3.50 Incl.	3.55 and Up



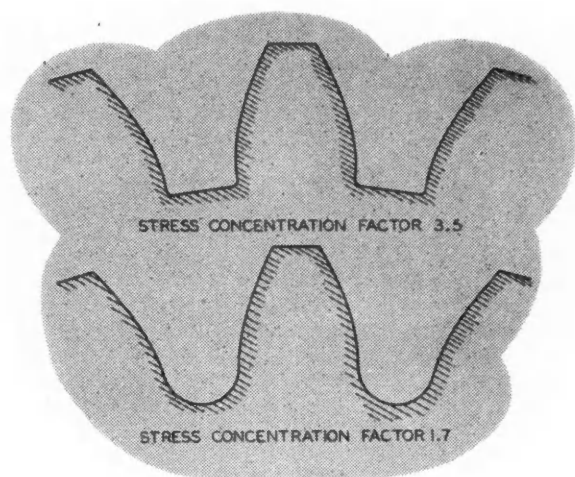


Fig. 5. Showing difference in the stress-concentration factors for teeth with minimum normal fillet and full radius at root

stances from entering it from the outside. To make sure that the air forced into the harness is dry it is best to locate the intake at a point where the temperature is relatively low. The air, moreover, can be dried by means of activated alumina. Air pressure within the harness has the effect of increasing the voltage at which corona appears, and therefore tends to suppress it.

The author did not go into any great detail in explaining the system and dwelt mainly on the injurious effects of corona and of acid or conductive liquids or vapors that may get into the harness. He stated that many flight interruptions are caused by ignition failure and that of the three elements of the ignition system, the magneto, the spark plug and the harness, the last-mentioned is by all odds the greatest source of trouble. What makes ignition harness on aircraft particularly prone to trouble is that the whole ignition system must be completely shielded electrically (to avoid radio interference) and because great variations in atmospheric pressure are encountered. Dead-air spaces are formed in the shields, which fill with injurious gases and liquids. These injurious materials enter the shielding in three ways. Rain, sleet, anti-icer fluid and oil enter through leaks in the shielding, and are a constant source of trouble in the spark-plug-shield chambers. Corona in the shielding or shield chambers produces ozone which attacks rubber. Ozone is also injurious to many metal surfaces, particularly in the presence of moisture. Another result of corona is the production of nitric oxide and nitric acid. When both moisture and nitric acid are present within the shielding chambers, acid conducting films are formed, which tend to cause arcing and carbonization of conducting paths (leakage paths). Once such a carbonized leakage path has been formed, the common practice of racing the engine to heat and dry out the spark-plug shield chamber will not restore proper functioning of the ignition system. Finally, water vapor containing certain impurities such as hydrobromic acid and sulfuric acid, enters the spark-plug shielding chambers through core leakage in the plugs.

In operation, airplane engines and their associated ignition systems are almost constantly covered with film of various fluids, some of which are sprayed on for purposes of cleaning and inspection, while others, such as the anti-icing fluid (a mixture of alcohol and glycerine) accumulate on the engine during flight, being thrown against it and the ignition harness with great force by the propeller wash. Then when the plane descends rapidly to a lower altitude, the atmospheric pressure outside the harness is greater than the pressure in its chambers and cavities, and the pressure differential drives the fluid into the ignition system.

The voltage required to produce corona drops with the atmospheric pressure, and corona phenomena, therefore, are more prevalent during flight in high altitudes. The author presented a mathematical analysis indicating that with the usual aircraft ignition cables, consisting of 19 strands of No. 29 B. & S. gage wire with an outside diameter over the wires of 0.056 in., covered with a first layer of rubber insulation 0.083 in. thick, a second layer of neoprene insulation 0.024 in. thick, and a final layer of lacquer insulation 0.005 in. thick, enclosed in metallic hose shielding of 5/16 in. inside diameter, the spark-plug breakdown voltages are higher than the voltages required to produce corona, especially at high altitudes.

Most parts of the ignition harness where the potential gradient is high are filled with rubber or other dielectric material, which excludes air from them and makes the harmful effects discussed in the foregoing impossible. This, however, does not apply to the spark-plug shield chambers. These chambers usually contain small springs serving as resilient connectors. The springs are made of materials whose crystals have very small radii of curvature, and at the surfaces of such materials the potential gradient usually is very high.

From the foregoing it will be understood that the spark-plug shield chamber is the heart of the problem. Materials within these chambers actually disintegrate through the action of acids, gases and vapors, and it is no uncommon experience to find the previously mentioned springs in these chambers rusted and broken.

Trying to make the shielding perfectly tight will not solve the problem, as some of the injurious materials originate within it. Two other preventives are based on the same fundamental principle. One consists in tightly weaving metallic shielding over the insulation of the cable, while the other employs conventional loose-fitting shielding which has the space therein filled with some plastic material, a paste or compound. These methods, which reduce the amount of air present in the shielding, have some merit, but they have no effect on the most important region of all, the spark-plug-shield chamber. Efforts to exclude air from the shield chambers by packing them with grease or compound have proved very unsatisfactory.

A third design of ignition harness, employing tightly fitting grommets in the spark-plug elbow fittings and elsewhere, is open to about the same objections as the one just described, in that it, too, isolates the shield chambers. Moreover, the tightly fitting grommets tend to cause the dielectric to puncture at these points.

**I**NE of the basic economic principles followed in the U.S.S.R. is to make use of all of the available sources of power. The country now ranks second as a producer of liquid fuels, and recent explorations indicate that its resources of such fuels are almost inexhaustible. But it is well supplied also with coal, peat, and lumber; so there is no reason why in Siberia, for instance, it should not use wood from the vast local forests as a source of fuel for automobiles and tractors; in Dombass its excellent anthracite, and in the Moscow region and the northern districts the large native deposits of peat; and why, finally in the agricultural districts the millions of tons of straw—an agricultural waste—should not be used for the same purpose. Why should liquid fuel have to be transported, often over thousands of miles, to places where fuels which can be made available for use in internal combustion engines by converting them into gas are abundant right on the spot?

Much work has been done already in the U.S.S.R. in connection with the introduction of gas generators for motor vehicles. In fact, the country at present occupies first place in the world with respect to the number of trucks and tractors equipped with gas generators. Several thousand gas-generator trucks have been produced already by Soviet automobile plants. Plans for the current year provide for the production of more than 40,000 gas-generator trucks of 1, 1½ and 3 tons capacity. Almost as large a production of truck-type tractors of 50 and 65 hp. is provided for in the program for the current year.

Up to the present, gas generators in the Soviet Union have operated on wood blocks of 2 by 1¾ by 1¾ in. size. Birch wood, which is an excellent fuel for gas generators, is used for the most part, but in some places it is mixed with coniferous woods. The latter are somewhat inferior for the purpose, owing to their higher resin content. Resinous vapors sometimes find their way into the engine cylinders, where they cause incrustation of valves and even sticking of piston rings.

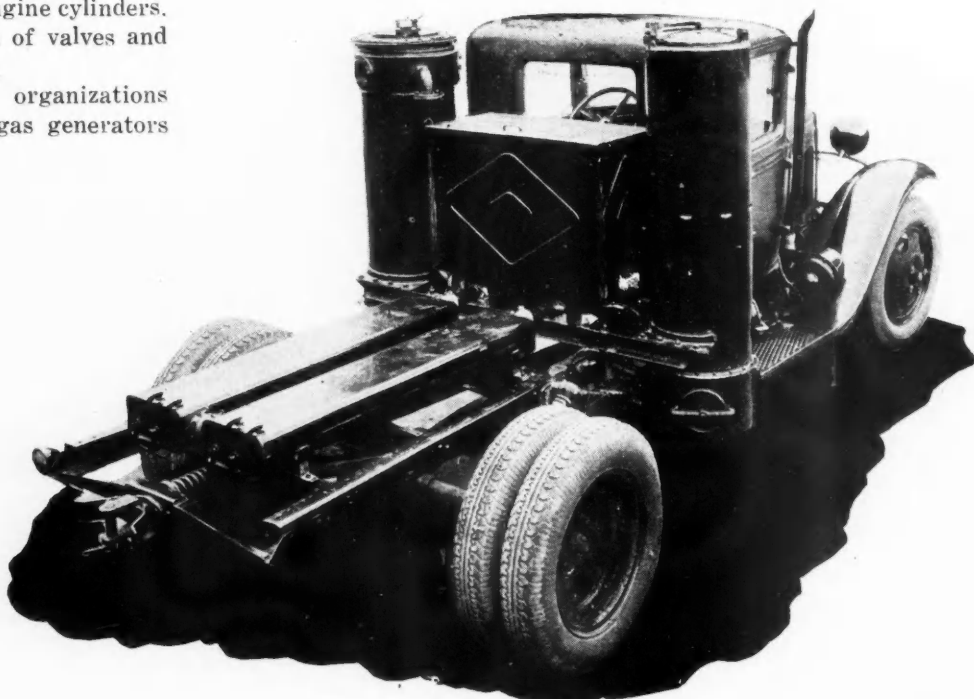
Soviet scientific-research organizations also have designed types of gas generators

**Fig. 2—Diagram of gas-generator installation on the 50-hp. truck-type tractor. 1, gas generator; 2, centrifugal cleaner; 3, gas cooler; 4, Rashig filter cloth; 5, gas filter; 6, to mixer.**

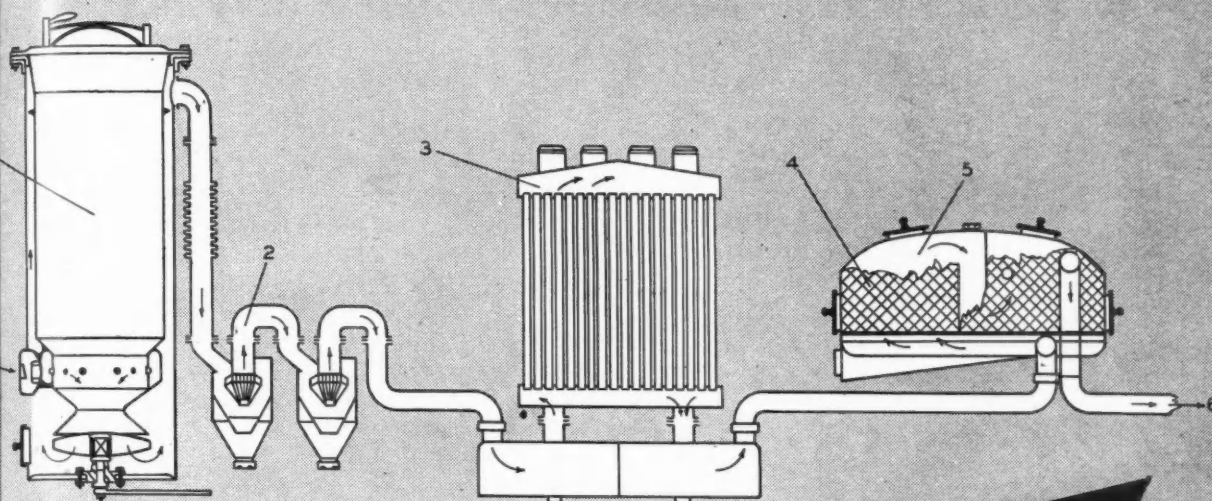
operating on charcoal and anthracite. Mass production of these will be taken up in the course of the next two years. Solution of the problem of gasifying these fuels also involved a solution of the problem of gasifying coke and peat. The latter can be gasified without being subjected to any preliminary treatment, but it is better to first form it into briquettes.

There are three basic types of gas generator, upright, inverted, and horizontal. For the gasification of wood, the inverted type of generator is being used in the U.S.S.R. Air enters the combustion chamber of the cast-steel generator from an annular air channel through a number of orifices in the circumference of the chamber. The air is drawn into the chamber by the suction of the engine, and during the starting period by an electric suction fan provided for the purpose. Carbon dioxide (CO<sub>2</sub>) produced by the combustion passes through the hot bottom layer of carbonized wood, where it combines with additional carbon to form CO gas, the principal fuel component of producer gas. Other com-

**Fig. 1—Gas-generator installation on 1½-ton truck. On the left is shown the gas generator and on the right the fine filter with Rashig (cloth) rings. Between the generator and the filter there is a box for additional wood blocks. On the truck frame there are two scrubbers for the preliminary cleaning of the gas. The electric fan for starting the generator may be seen at the right in the illustration.**







## Automotive Gas Generators Used in the U.S.S.R.

ponents of the gas include hydrogen, methane ( $\text{CH}_4$ ), small quantities of other hydrocarbons, carbon dioxide, nitrogen, water vapor, and occasionally traces of oxygen. In addition, the generator gas may contain resinous vapors and organic acids.

On the way to the engine the gas is strained to rid it of solid particles of coal or ash, and is cooled. Gas thus purified and cooled to 85-95 deg. Fahr. is delivered to the combustion chambers of the engine through a mixer, in which it is mixed with the air necessary for its combustion. As the generator gas, which is a mixture of several elementary gases, already contains oxygen in several of its components such as carbon monoxide, carbon dioxide and water vapor, the proportion by weight of air required for its combustion is much less than in the case of gasoline fuel. For each (weight) part of the gas entering the combustion chamber, from one to one and a half parts of air must be supplied. The mixers used on Soviet gas-

generator vehicles are designed on the three-way valve principle: that is, they have an inlet for gas, another inlet for air, and an outlet for the mixture.

Engines can be started either directly on generator gas or on gasoline. In the first-mentioned case the generator is started operating by means of an electric fan which draws air through it. After the fan has been turned on, a torch is applied through an opening in the air channel. The flame is sucked into the combustion chamber, and the fuel near the air nozzles is ignited. Thus the process of gas generation is started. After an interval of from 3 to 6 min., the fan draws a definite mixture of air and gas, which at first is discharged into the atmosphere. Then a valve in the gas line is turned, which shuts off the fan and connects the line to the engine, which can then be started either by hand or by means of an electric starter.

The second method consists in starting the engine on gasoline. After it is once started, the engine produces a suction effect on the generator, which is ignited as in the preceding case. The gas generated passes to

(Turn to page 551, please)

GAS GENERATORS



# Glass-Insulated

**T**O THE insulating materials for magnet wires which have been available in the past—enamel, cotton, silk, and asbestos, and the less-generally-used paper, cellophane, and cellulose acetate—there has now been added another, in the form of glass fibers. Glass-insulated wire already has found application in the production of electrical equipment for automobiles.

It has long been known that glass is a good electrical insulator, but its physical properties in its

By P. M. HELDT

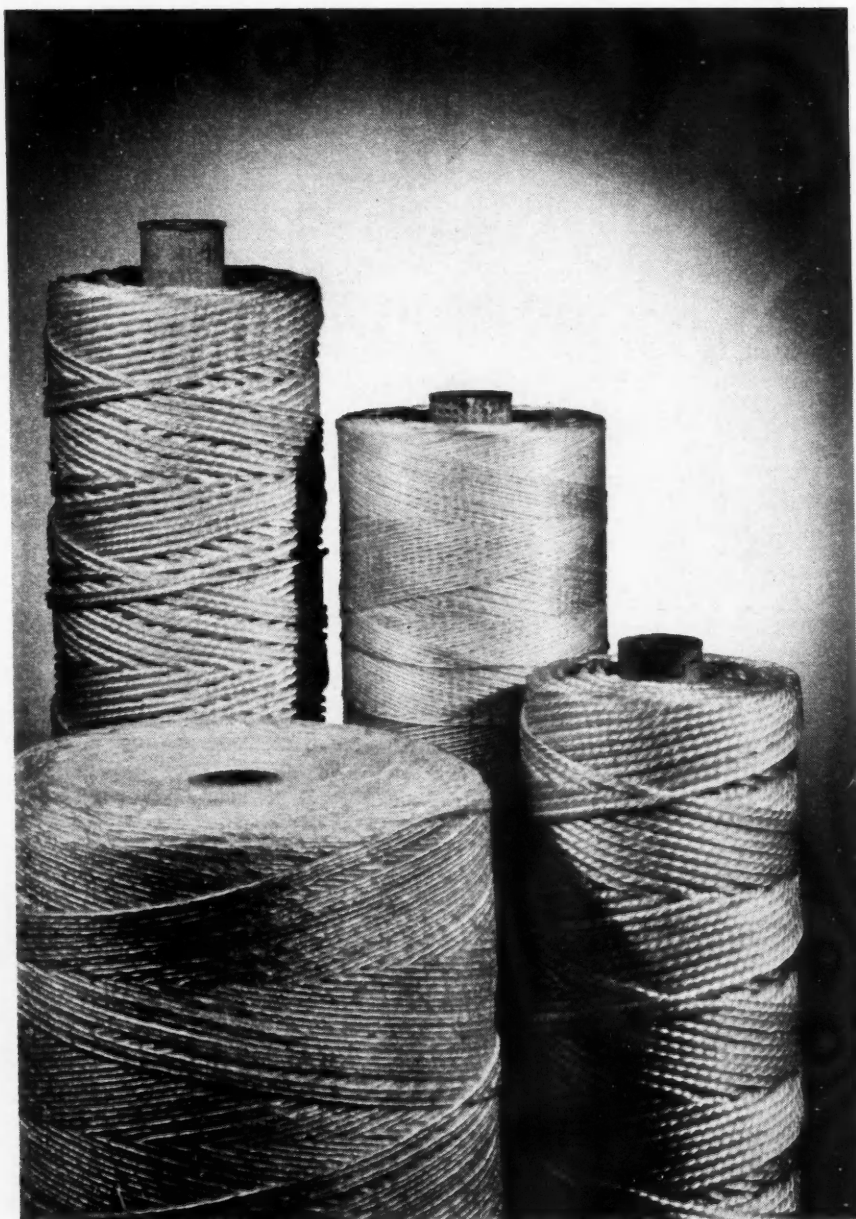
natural form, and particularly its brittleness, rendered it unsuitable for coating electric wires. However, when glass is drawn or blown into very fine fibers it loses its brittleness; it retains its high dielectric strength and other excellent electrical properties, and it develops extreme tensile strength.

A process for the manufacture of yarns and textiles from glass was developed by the Owens-Illinois Company, starting about 1934. Staple fibers of an average diameter of 0.00027 in. and an average length of

about 9 in. are produced by directing a blast of air or steam across streams of molten glass issuing from numerous tiny orifices in a heated metal plate. These fibers are deposited on a moving band and gathered together into a continuous sliver, which is then spun and twisted into a yarn. The individual fibers are smooth and substantially cylindrical.

A small amount of lubricant is applied to the staple fibers to improve their processing characteristics and to reduce friction between adjacent fibers. Without a lubricant there is a tendency for the fibers to scratch each other, and such scratching tends to induce breakage. The lubricant used is said to be compatible with commonly-used insulating varnishes.

In addition to being made in staple-fiber form by steam-drawing of the molten glass, the material is produced also in the form of continuous fibers by extruding the molten glass through tiny orifices in a metal nozzle. These continuous fibers are drawn from the orifices at velocities of up to 7,000 ft. per min. and may be miles in length. The staple fibers are processed in about the same way as cotton or worsted fibers, while the continuous fibers are processed like silk or rayon.



*Fiberglass cords and yarns*

# Magnet Wire

*Cut-away view of commutator showing Fiberglass-insulated V rings*

The trade-marked name "Fiberglas" has been applied to fibers, yarns and textiles produced by means of this process, which is owned and worked by the Owens-Corning Fiberglas Corporation of Toledo, O.

For the production of electrical yarns a special glass is used, which is free from the oxides of the alkali group of elements, such as soda and potash. These yarns are resistant to weathering, corrosive vapors and moisture, and they withstand very high temperatures. When properly applied the yarns are said to have very high dielectric strength and electrical resistance.

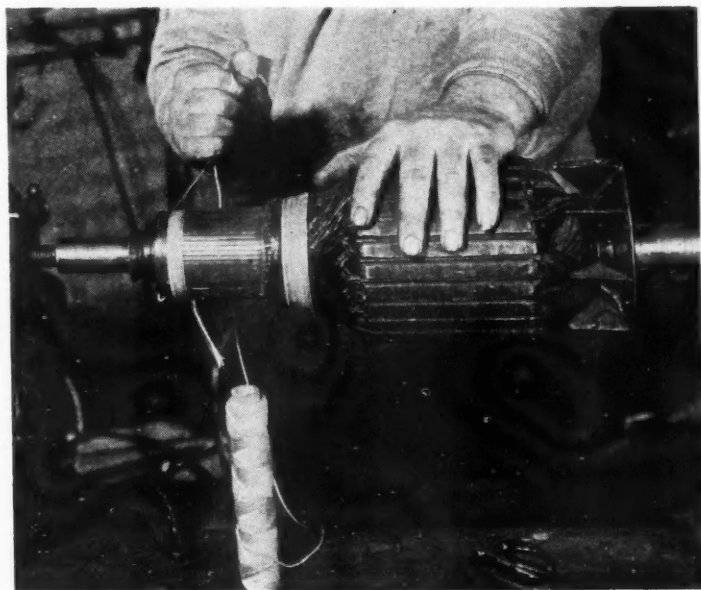
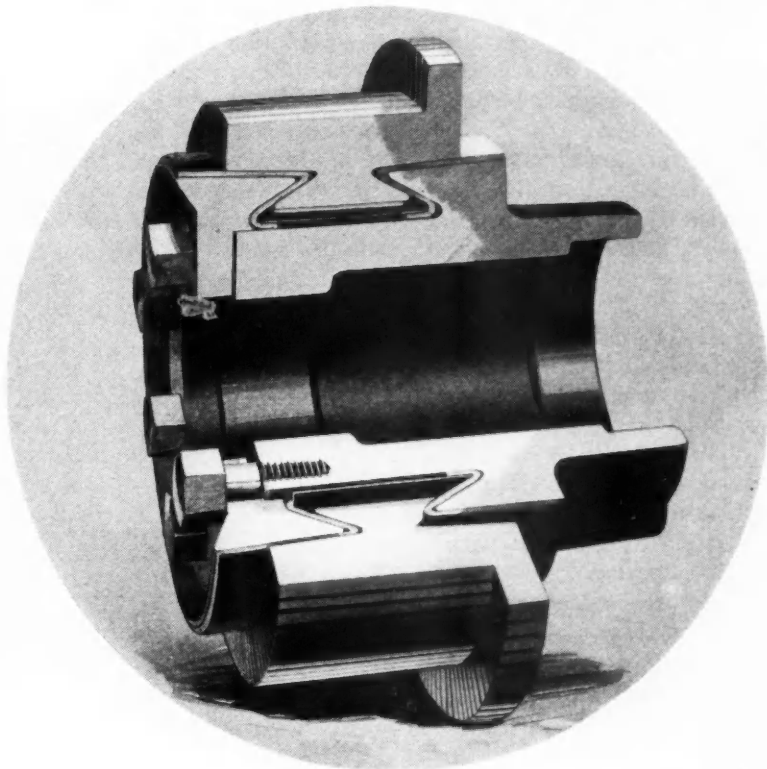
Both the staple and the continuous fibers are inorganic and incombustible, which is one of the chief advantages of the insulating material made from them. They are also non-absorbent and non-hygroscopic. In addition, they are resilient, extremely flexible, and have tensile strengths exceeding that of piano wire, according to the manufacturer. These properties are peculiar to glass in the form of very fine fibers.

The continuous fiber is of even smaller diameter than the staple fiber, the average diameter being 0.00022 in. Filaments from 102 orifices are combined to form a fine strand. These strands of filaments are drawn without twist, and the filaments of one or more strands are then twisted to-

gether to form a fine yarn. A small amount of lubricant is used also on the continuous strand. It keeps the individual glass fibers apart and facilitates manufacturing operations. It is understood that glass of optical quality must be used in the making of fibrous glass textiles. All continuous filaments lie parallel in the strand, and a smooth yarn results. Yarns may be plied by twisting two or more together to form any desired yarn, thread or cord.

Staple fiber is blown onto a traveling belt in the form of a web or ribbon of interlaced fibers, from which it is "gathered" without twist as a "sliver." In the gathering process the fibers are slightly drafted, so that the majority lie parallel to the length of the strands. This is the raw material of staple fiber rovings and yarns. A roving is a sliver with a low twist, and is formed by simply twisting the sliver on a standard twister or flyer twister. A yarn is a sliver or roving given a higher twist. Fine yarns of glass staple fiber are made by drafting sliver as in the worsted-spinning process. Coarse yarns are made without drafting.

Glass-fiber yarns are designated by their count. The count of a glass-fiber yarn is the number of yards per pound divided by 100. Only the weight of glass is figured with, the



*Application of Fiberglas cord to a motor armature*

weight of binder present being neglected. Thus a yarn of 900 count is one of which 90,000 yards weigh one pound plus the weight of the binder. Twist is designated in number of turns per inch, and its direction by the letter S or Z. A yarn or cord has "S" twist if when held in a vertical position the helices conform in slope to the central portion of the letter S, and "Z" twist if the helices conform in inclination to the central portion of a Z. Balanced construction results when the twisted yarns are plied with an opposite twist, the second twist offsetting the tendency of the first to unwind.

Fiberglass yarns have greater physical strength than required in any of the numerous applications so far developed. Staple Fiberglass yarns may be distinguished from continuous filament yarns by their slightly fuzzy appearance. This "fuzziness" is believed by some users to be an advantage where the yarn is to be impregnated, as the impregnating material bonds better with the glass.

An important advantage of Fiberglass-insulated wires is that the individual glass fibers are non-absorbent and non-hygroscopic. It is claimed that when the wires are properly impregnated, the insulation (glass plus varnish) shows superior moisture-resisting qualities. The accompanying chart shows the results of tests made to determine the deterioration of various magnet-wire insulations through immersion in water. Two pieces of magnet wire were twisted together over a length of 3 in. Two samples of each insulating material were tested. First the insulation resistance under ordinary room conditions was determined. Samples were then immersed in water, the ends being kept dry by having them protrude from the water. At definite intervals the samples were removed and jarred to detach the water drops adhering to them, and their insulation resistance was then determined anew.

Tests were made of the moisture absorption of various insulating materials and the results plotted as percentage of the dry weight of the insulation on a base of relative humidity. From these plots it is seen that glass absorbs only about one-twentieth as much moisture as silk under similar conditions, and that an insulation consisting of a double glass covering and varnish is best of all from this point of view.

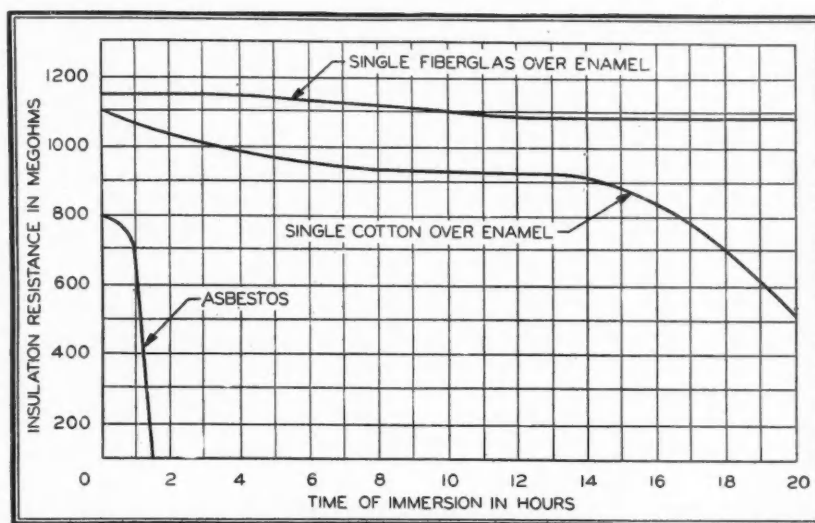
Although glass fiber has been and is being used as a heat-insulating material under certain conditions, the heat-insulating effect is due largely to the entrapped air. Glass electrical insulation, however, actually is a better conductor of heat than either cotton or asbestos insulation. The result is that when glass fiber is used as an insulating material for the magnet wire of an electrical machine, for a certain wattage

input the maximum or "hot-spot" temperature will be lower than if the same machine had magnet wire with either cotton or asbestos insulation. In certain tests with cotton-insulated wire the hot-spot temperature was shown to be 23 per cent higher, and, conversely, the same tests showed that if a certain hot-spot temperature must not be exceeded, the input with cotton insulation did not exceed 62 per cent of the maximum permissible with Fiberglass insulation.

From diagrams published by the manufacturers it appears that the dielectric strength of single or double-covered Fiberglass-insulated wire is about 25 per cent greater than that with an equivalent cotton covering.

Two properties which seem to recommend glass-insulated magnet wires particularly for automotive purposes are that the insulation is slightly more compact than the commonly used cotton, and that the glass will withstand far higher temperatures than cotton.

According to one manufacturer of glass-fiber-insulated magnet wire, the diameter over the insulation of this wire is somewhat smaller than the diameter of the corresponding gage of single-cotton-covered



*Effect of immersion in water on resistance of various wire insulations*

wire. The actual diameter of the glass-insulated wire will vary somewhat with the amount of bonding material used, but in no case should the maximum diameter be greater than the comparable diameter of the cotton-covered wire. Approximate diameters of various gages of bare and insulated magnet wires are given in the table on the next page.

As to the heat resistance of Fiberglass insulation, the manufacturer states that it will successfully withstand temperatures in excess of 1000 deg. Fahr. without impairment of its electrical properties, and temperatures of up to 650 deg. Fahr. without losing its original flexibility and resilience. The output ratings of electrical machinery are based on the temperatures which their insulations will withstand without injury. The ordinary organic insulations, such as cotton, silk,





*Taping an armature coil with Fiberglas tape*

linen and paper, rarely are able to withstand a temperature rise in excess of 130 deg. Fahr. above an ambient temperature of 104 deg. Fahr. Where higher temperatures must be withstood, asbestos is sometimes used, in spite of its low tensile strength and high space factor (bulkiness); or resort is had to mica, notwithstanding its cost and mechanical properties. Where Fiberglas insulation is used, the maximum operating temperature of the apparatus is usually determined by the impregnating material, for Fiberglas yarns will withstand higher temperatures than any impregnating materials known.

One of the large wire companies furnishes glass-insulated magnet wires in four forms, viz., single glass-yarn-covered, double glass-yarn-covered, single glass-yarn enameled and double glass-yarn enameled.

Glass-insulated magnet wires in automotive electrical machines will enable these machines to operate safely at higher temperatures, and higher outputs therefore may be obtained from machines of given size. If, on the other hand, the output is not increased, the factor of safety against burn-outs will be raised. If glass-insulated magnet wires should be generally adopted, the prospects are that burning out of armatures and field coils due to insulation failure will be practically eliminated and that the limit to the temperatures at which electrical generators and motors can be operated will be set by failure from other causes.

Fiberglas is used for electrical insulating purposes

also in other forms. Glass tying cord, for instance, is used for binding wires, coils and other parts of electrical apparatus, such as lead wires from the armature coils to the commutator in direct-current motors. These cords are made of both continuous filament and staple-fiber yarns. The chief difference between cords of continuous-fiber and staple-fiber yarns is that whereas the former are smooth, the latter are slightly fuzzy, like worsted yarns. The cords are given a treatment to increase their resistance to internal abrasion and to increase their knot strength. The coating applied consists of a mixture of oils which is non-corrosive and has good electrical properties. It may be removed with naphtha or carbon tetra chloride.

Electric insulating tapes also are made of glass-fiber yarns of either the continuous-fiber or staple-fiber type. These tapes, while made of pure glass, also may be treated with impregnating materials to produce an adhesive tape. Continuous-filament tapes, which are smoother than the staple-fiber type, can be made in smaller thicknesses than are possible with staple-fiber yarns. Staple fiber yarns are always used for very heavy tapes. Both types are available in 10 and 15 mil thicknesses.

Laminated sheet insulating material is manufactured by super-imposing suitably treated layers of glass-fiber cloth and forming under heat and pressure. Sheets of such material are said to have high tensile and shearing strengths, and high resistance to impact. The glass-fiber cloth is unaffected by high temperatures and if the impregnating material also is highly heat-resistant, the resulting product can be used successfully where high temperatures must be withstood. In one case where a laminated material with a cotton base failed after 24 hours at 320 deg. Fahr., a similar material with a glass-fiber base was not affected by the same treatment as far as its electrical properties were concerned, and its tensile strength was still 90 per cent that at room temperature after 360 hours at 350 deg. Fahr. One of the outstanding advantages of Fiberglas laminated materials is said to be their low

*(Turn to page 545, please)*

#### APPROXIMATE DIAMETERS OF BARE AND INSULATED MAGNET WIRES\*

A. W. G. No.	Bare Wire	Plain Enameled	Single Silk	Single Glass	Single Cotton
12	0.0808	0.0827	.....	0.0840	0.0854
15	0.0571	0.0588	0.0587	0.0603	0.0617
18	0.0403	0.0418	0.0419	0.0435	0.0449
21	0.0285	0.0299	0.0301	0.0317	0.0331
24	0.0201	0.0213	0.0217	0.0233	0.0247
27	0.0142	0.0152	0.0158	0.0175	0.0188

\* There are maximum and minimum limits on the diameters and the figures here given are mean or nominal values.

# MEN and MACHINES

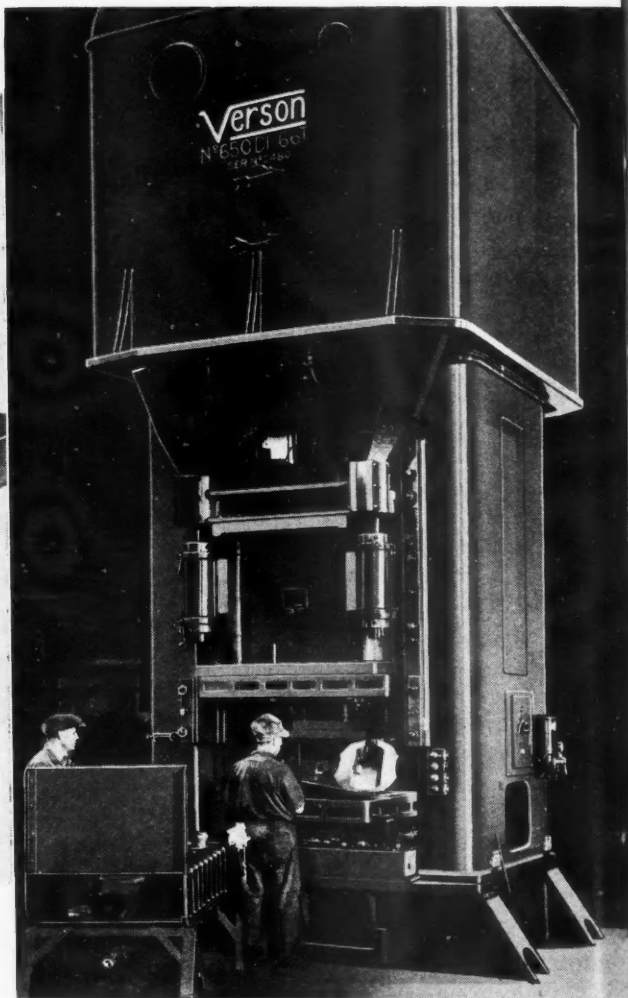
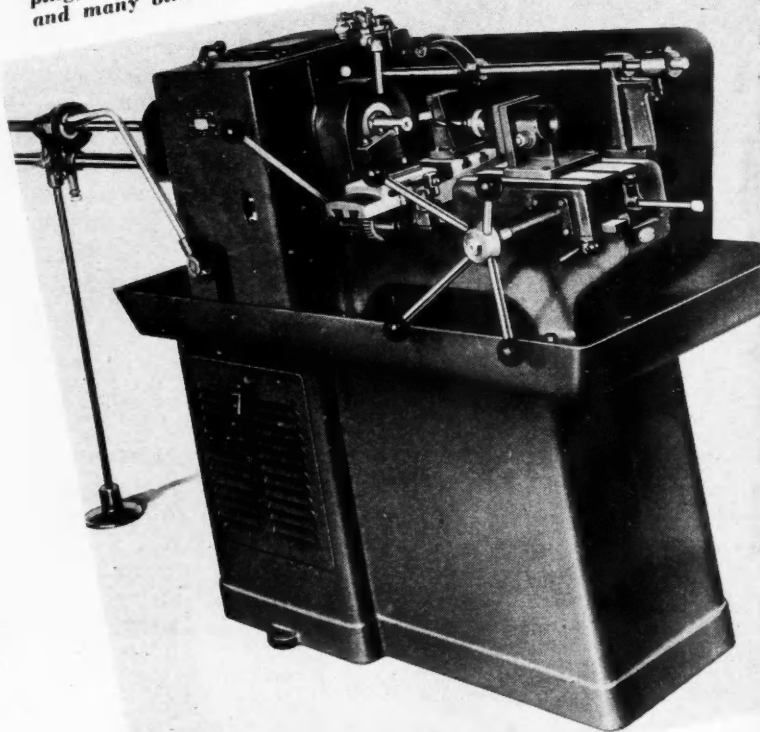
**M**ACHINE tool builders will welcome the announcement of major changes in the National Electrical Manufacturers Association's motor dimension standards. These changes, effecting substantial reductions in weight, space and size, are the first to be made since the original standards were adopted by the NEMA 12 years ago. Two factors, mainly, have made the progressive move possible: First, improved silicon steels that permit the use of less motor iron in producing the same amount of power; second, new synthetics and new

By H. E. BLANK, JR.

cloth insulations of higher dielectric strength that permit coil insulation, of the same quality as formerly, in smaller space. Here is an explanation for the standards revision: Up to 1928, motor builders developed their own designs and consequently many shapes and sizes for motors of the same rating came into being. Recognizing that the wide variety was having disastrous effects on the cost of applying and maintaining motors on machines, both in engineering time on the part of the machinery builder, and in troubles and delays caused the motor user due to lack of interchangeable replacements, motor manufacturers through NEMA worked with customer industry groups and adopted standard motor mounting dimensions during the latter part of 1928. In the 12 years intervening, the many advances discovered in the art of motor building made it possible to build motors of the same horsepower and speed much

*(Below, right) A new 859-ton Verson hydraulic speed press. This particular machine is set up for deep drawing crankcases.*

*(Below) The Oster "Rapiduction" lathe for cutting-off, boring, tapping, reaming, facing, threading and many other jobs.*





Westinghouse men, T. C. Kelley (right), manager of motor sales, R. W. Owens (left), motor division manager, and A. C. Streamer (center), head of the East Pittsburgh Works, discuss the difference between a new motor, built in accordance with revised NEMA standards, and an older model at the left. Both motors have the same ratings, and have almost identical electrical characteristics.

smaller. However, in order to retain the benefits gained by the standards, these weight and space saving possibilities could not be made available as the knowledge developed. By early 1940 their number had grown to such proportions that a revision of the standards was in order. These revisions are now in effect.

In keeping with the NEMA revisions, Westinghouse Mfg. Co. reveals that it just completed a broad program of motor re-design which covers an even wider scope of improvements than are called for by the new standards. Whereas, smaller dimensions and lighter weights specified by the new standards will affect only those motors from  $\frac{3}{4}$  to 2 hp., the Westinghouse program affects motors from  $\frac{1}{2}$  to 3 hp. Frame shapes have been re-designed and a new bracing structure gives them more strength. The frames are lighter. Ball and sleeve bearings and their housings have new type seals against dust and dirt. The machine designers' problem of blending motors and machines for smart appearance has been met by the use of smooth finish and curved lines.

**T**HE OSTER MFG. CO., Cleveland, Ohio, has developed a machine with a capacity of 1½-in. (round) for cutting-off, boring, tapping, reaming, facing, threading and many other jobs. Known as the "Rapiduction" lathe, it has a swing of 13 in. over the bed and six inches over the cross slide.

The spindle runs on ball bearings and is built with an American Standard flanged type nose. It is driven by hardened and ground steel worm and bronze worm gear. The worm shaft also is mounted on ball bearings. Drive is by multiple Vee belts from the motor to the worm shaft, speed changes being obtainable through quick-change sheaves giving spindle speeds from 140 to 1000 r.p.m.

Equipped with a cross slide and saddle, the machine may be set up quickly and easily for three operations.

**A**N 859-TON hydraulic speed press built by the Verson Allsteel Press Co., Chicago, was installed recently in the plant of the Wayne Works, Richmond,



Ind. It has a 42-in. adjustable stroke, 100-in. daylight space, and a 95-in. by 144-in. bed area. The press is equipped with a high speed two-way variable displacement pump. With the solenoid remote controlled pump of this type, independently adjustable, pre-set volumes in either direction and a neutral by-pass position can be selected at will from a push button control station.

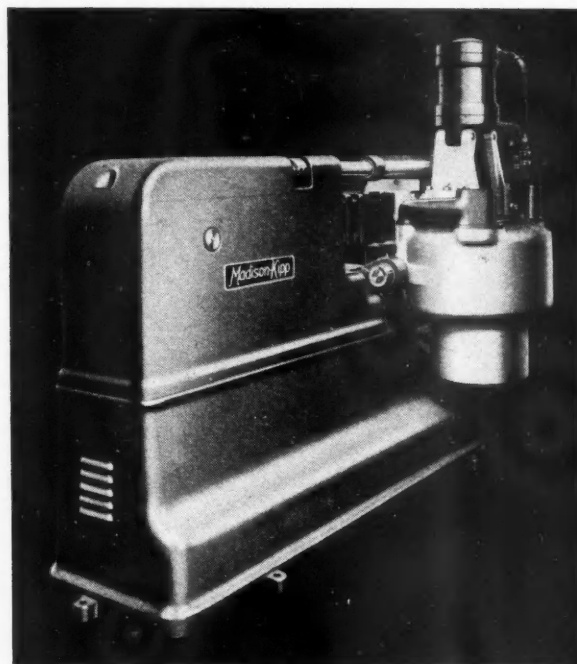
As the operator pushes the operating button, oil from the pump flows into the top of the two traversing cylinders. This causes the ram to move downward at high speed, during which time the main cylinders are prefilling by gravity through a sliding piston type surge valve. When the resistance of the work is met, the sliding piston type surge valve automatically slides over to the pressure side, closing the gravity prefill and applying full pressure to the traversing cylinders and the main cylinders and the main cylinder as the ram moves downward to do the work.

Reversal is accomplished by introducing oil under pressure beneath the traversing cylinders, causing the surges to shift. This allows the oil from the main cylinder to be forced back into the reservoir. At the top of the stroke, the slide contacts a limit switch, which brings the pump to the neutral by-pass position.

**T**HE MADISON-KIPP CORP., Madison, Wis., has developed a new zinc alloy die casting machine. It is known as the Giant Kippcaster Model 500 to differentiate it from the Standard Kippcaster which has been produced by the company for many years. The new machine is, in general terms, about twice as large as the Standard. Its weight is more than four times that of the Standard. Whereas the earlier model machine is fully pneumatic, the new one is hydraulically and air operated. The die head ram is operated hydraulically through a toggle arrangement which is actuated by a hydraulic cylinder. Pressure for the hydraulic system is supplied by a Vickers combination pump mounted on a 1½-hp. motor. The standard die head is 8 in. by 10 in., but clearance is provided so that larger dies can be applied. Both the stationary and the movable dies may be of two standard thicknesses, either 3 in. or 4 in.

Stroke of the machine is 8½ in. and when an air cylinder of 7½ in. is provided with a metal plunger of 1¾ in., a pressure of 1836 lb. is exerted on the metal when the air pressure is 100 lb. per sq. in. The gooseneck with plunger has a capacity for shooting a 3½ lb. casting in zinc alloy. Pot capacity is 200 lb.

**A** MACHINE tool fixture developed by the Wesson Co., Detroit, is designed to increase the range of work which can be done on drill presses, grinders and milling machines. It is known as the Wesson Universal Angle Plate. A universal base with patented cradle design is fitted with a slotted top plate. The plate may be adjusted in three planes; each plane completely graduated. Through the use of the device, parts which are too large or of too irregular shape to be held conveniently in a vise can be clamped by means of T-slots in the top plate. Once the work is clamped to the Angle Plate and the angle established, it need not be disturbed as the device may be moved from one machine to another without removing the work.



*The Madison-Kipp Corp.'s model 500 Kippcaster.*

**A**N "INTERMITTENT" scrap cutter recently announced by the F. J. Littell Machine Co., Chicago, cuts either finished material or scrap to any length, based upon a predetermined number of strokes of the punch press. In normal operating position the cutter blades are held open, so held by springs on the slide of the scrap cutter which is constantly maintained in its open position. A gag or blocker unit is built into the rear scrap-cutter connection. The gag is connected to and operated by a solenoid which, when energized, moves the gag to the blocking or cutting position. The solenoid is connected electrically to the controlling unit which consists of a ratchet, a driving mechanism for operating the ratchet at one or more teeth per stroke of the press, and a switch operated by trip lugs placed at stated points on the ratchet gear.

In operation the trip lugs are placed at points on the ratchet gear, tripping the switch every so many strokes of the punching press. For example, if it is desired to cut off a strip of metal at every 20 strokes of the press, a 60-tooth ratchet is selected and three trip lugs are placed at equally spaced points on the ratchet gear. The intermittent feature may be added to any Littell scrap cutter now in use by making a simple change in the scrap cutter slide, together with the addition of a few other parts.

**A** NUMBER of new special units and accessories are now offered by the Barber-Colman Co., Rockford, Ill., for its No. 3 standard and precision hobbing machines. The application of these devices increases the efficiency of the standard machines, or adapts them to special classes of work.

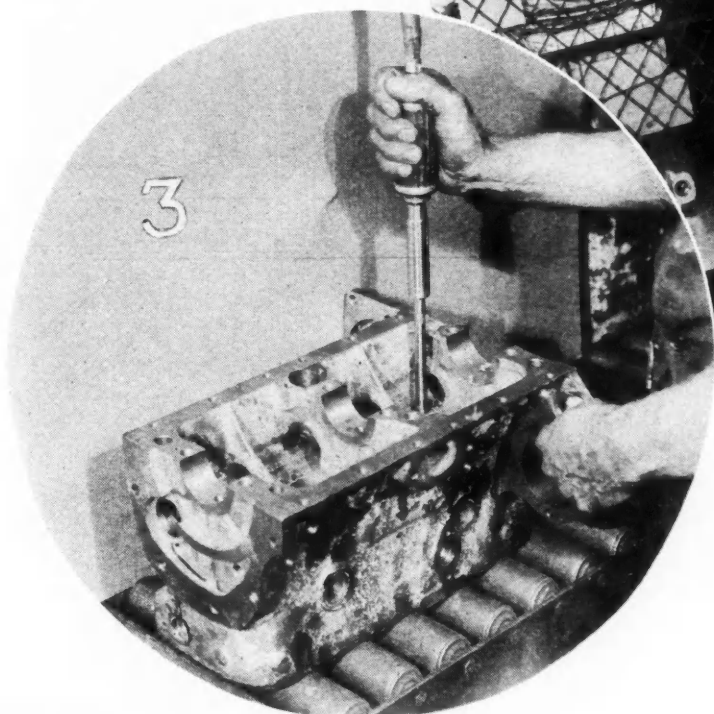
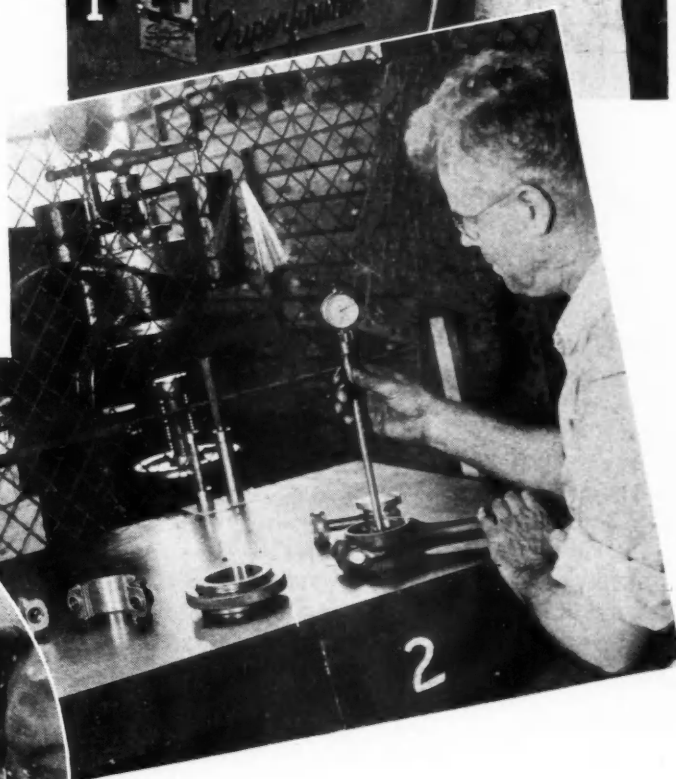
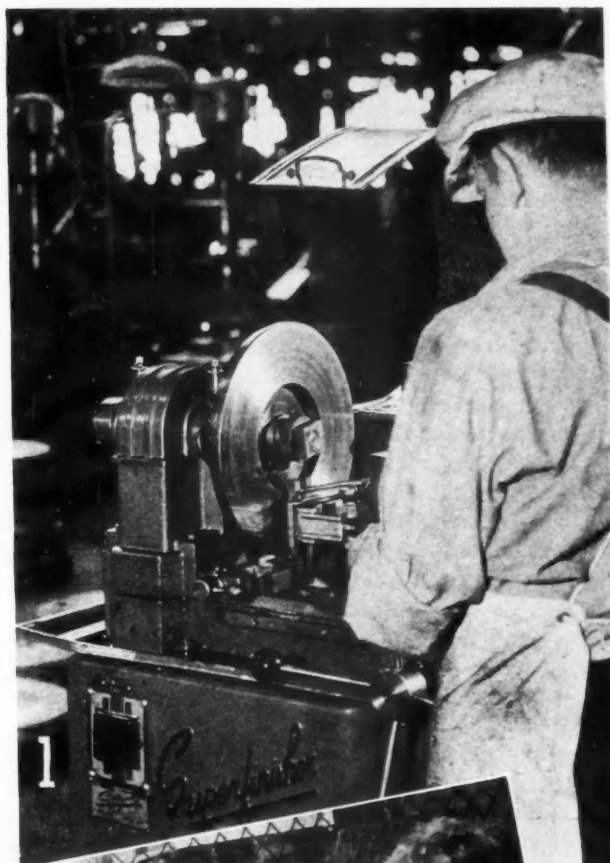
Among the new devices are the following: A vertical feed which is desirable for cutting worms and worm gears, being of exceptional advantage for cutting  
(Turn to page 544, please)

# Precision Production at Hercules

**T**HE ACCOMPANYING PHOTOGRAPHS and data covering manufacturing operations at the Canton, Ohio, plant of the Hercules Motor Corp. are excellent examples of precision work under mass production conditions. Hercules is one of the largest companies specializing in the design and construction of gas and Diesel engines, exclusively. The line includes a wide range of engines and power units, covering six-cylinder, four-cylinder, and two-cylinder gasoline engines and six-cylinder, four-cylinder and two-cylinder Diesels.

1. Superfinishing clutch contact face and oil seal on flywheels on a Superfinishing machine. In this operation surface finish is held to approximately 10 to 15 microinches on the clutch face and seven to 10 inches on the oil seal diameter.

2. Crank hole gaging of model RXL precision heavy duty connecting rod after grinding on Heald Gage-Matic internal grinder. Following this inspection, bearing shells are assembled and precision bored to size. Limits are as follows: 0.0005 in. out of round; 0.0002 in. taper. A Subito inside cylinder dial gage graduated in 0.0001 in. is used to check. Rods, after disassembling and reassembling, must come within the named tolerance.



3. Bearingizing valve tappet holes in the Hercules model ZX cylinder block using Buckeye 4500 r.p.m. pneumatic tool and Cogsdill bearingizing tool. Bearingized holes are held to 0.0005 in. limit for diameter. The hammering action of the tool increases density of the metal around the hole and provides a hard smooth lasting finish.

worms which are "blind" at each end. Horizontal cam feed is provided for feeding the hob slide forward short distances, after which the slide is returned rapidly to starting position. A handwheel operated collet is particularly adapted to work occurring in small lots where it is desired to hold tool expense to a minimum. Barber-Colman offers also a lever operated collet which is adapted to high production hobbing work because it provides a rapid method for chucking pieces. There is a hob swivel designed especially for work of too high an angle for the standard swivel to accommodate, such as high angle helical gears, worms and threads. It is made without outboard support to the hob spindle, thereby permitting the hob to approach as closely as possible to the work spindle. This swivel does not affect the standard machine ratio, and performs functions similar to the 90 deg. attachments on large machines. A left hand hob swivel is used for hobbing right hand helical gears which have large angles ranging between approximately 30 deg. and 60 deg. This attachment permits the work to be held closer to the work spindle, thereby improving the accuracy and finish of the work. A micrometer adjustment for the hob slide is available for making new hob settings. A graduated dial tells the operator at a glance just the distance the slide is being moved. One shot oiling system is provided for lubricating manually all important bearings of the machine at one time. The system consists of a reservoir mounted on the upright and is connected to all important bearings by means of fixed and flexible tubing. A hand operated pump injects oil into the system and delivers it under pressure to the bearings. Metering nipples are employed in the tubes to govern the delivery of the proper amount of oil to each point.

Still another new device offered by Barber-Colman is the taper hob spindle which is designed to obtain extra fine finish, greater accuracy and longer hob life. It permits the hobs to be located on the spindle with consistent accuracy. Runout error is said to average only 0.0001 in. to 0.0002 in. A high speed hob swivel is made available for fine pitch class of work, and small diameter work which usually requires smaller diameter hobs than the minimum size for the standard  $\frac{3}{4}$  in. spindle. A variety of gear ratios are provided to produce maximum hob r.p.m.'s as follows: 533 (standard), 800, 1066, 1200 and 1800.

**H**ERE, briefly, are a number of other products which have been announced within the past month:

**Chicago Rivet & Machine Co., Chicago**—An automatic multiple rivet-setter which is actuated electrically by the positioning of the work over anvils. It requires no foot motion by the operator and will, it is claimed, produce a higher production speed and maintain a better, more uniform quality of work.

**Durakool, Inc., Elkhart, Ind.**—Two new mercury switches with construction characteristics that enable them to carry substantially greater currents than the regular Durakool switches with the same dimensions.

**Laminated Shim Co., Inc., Glenbrook, Conn.**—Thin shim stock supplied in slotted cartons is now furnished plainly marked in inches on its edge. The markings go from 0 to 100 in., with half-inch subdivisions throughout the 100-in. length.

**The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J.**—Condor whipcord endless belts

now carried in stock in a number of sizes and in two styles. Two styles stocked are capable of handling drives from  $\frac{1}{4}$  to 25 hp., and applicable to more than 1500 different drives.

**The Tannewitz Works, Grand Rapids, Mich.**—Contour sawing machine, the model 24M, which provides a rapid and economical method of die sawing, filing and polishing.

**Independent Pneumatic Tool Co., Chicago**—A device known as the Thor "Pix-Up" Finder and Adjusto-Tray which sorts, picks up and holds screws for driving. It is designed to eliminate the time wasting hand operations of picking up screws by the fingers and starting or holding the screw in tapped or drilled hole.

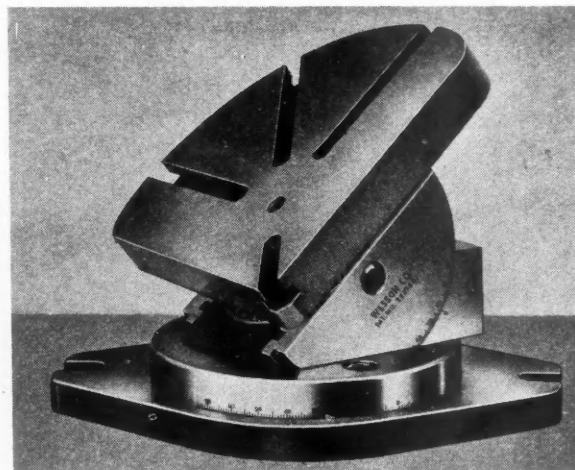
**H. O. Bates, Elizabeth, N. J.**—The Acromarker name plate stamping machine which is designed for stamping complete name plates from metal strip and for filling in serial numbers, specifications and other information into etched, embossed, cast and other types of metal, fibre and plastic name plates.

**Bogue Electric Co., Paterson, N. J.**—This firm has expanded its line to include motor generator sets at 200 KW, synchronous motors to 200 hp., d.c. motors to 400 hp., automatic battery charging sets and generating units for Diesel, steam, hydraulic and gas engine drives complete with switchboards and accessories.

### Publications Available

Carburizing equipment manufactured by the Hevi Duty Electric Co., Milwaukee, Wis., is the subject of bulletin HD-940.\*

Barber-Colman Co., Rockford, Ill., has prepared a hobbing time calculator in the form of a slide rule. It is offered free of charge to time estimators, production man-



*Wesson universal angle plate designed to increase the range of work which can be done on drill presses, grinders and milling machines.*

agers, superintendents, foremen, and others who have to do with hobbing problems.\*

Special units and accessories for the No. 3 standard and No. 3 precision hobbing machines built by the Barber-Colman Co., Rockford, Ill., are described in bulletin F-1410-1.\*

Price list No. 5, containing new prices on 20 standard Kennametal-tipped tools, five styles of Kennametal blanks, nine semi-standard tools, two milling cutters, and three lathe and grinder centers, has been issued by McKenna Metals Co., Latrobe, Pa.\*

Keystone Carbon Co., Saint Marys, Pa., has published a 24-page catalog covering its line of Selflube Porous Bearings.\*

(Turn to page 564, please)



# Glass-Insulated Magnet Wire

(Continued from page 539)

moisture absorption. Organic materials, such as cotton, have a tendency to swell when they absorb moisture. The individual glass fibers are non-absorbent and cannot swell. It is claimed that Fiberglas laminated products machine as readily as laminated materials with any other base.

Mica, which has excellent electrical properties, leaves much to be desired from the mechanical point of view, and is often combined with paper or cloth to give it the necessary flexibility, strength, and handling qualities. These "backing" materials, however, are organic in character and lower the insulating properties and the resistance to heat of the combination. For this reason, Fiberglas has been combined with mica to form a backing that has very desirable properties, and when mica and Fiberglas are combined

by a suitable temperature-resistant binding agent, a superior heat-resistant electrical insulating material is produced. Even if the binder should burn out under extreme operating conditions, the Fiberglas remains intact and furnishes protection against abrasion and flexing, while the mica maintains its high dielectric strength.

As Fiberglas cloth can be had as thin as 0.002 in., very thin Fiberglas-mica combinations can be readily produced. The thickness of the cloth can be varied at will, and it can be placed either on one side or on both sides of the mica. Such Fiberglas-mica combinations are used for V rings and bushings for the commutators of direct-current motors, for insulating tubes or troughs for armature slots, and as sheet material for insulating small parts in switches and connectors.

## PRODUCTION LINES . . .

### Aluminum Finishes

Bringing up to date the available information on finishes, the Aluminum Co. of America, has issued a new brochure entitled, "Finishes for Aluminum," which was distributed at the National Metal Exposition. This bulletin covers in detail finishes in the following general categories—mechanical finishes, chemical finishes, electrolytic oxide finishes, electroplating, Alclad products, and paint, lacquer, and enamel finishes. Be sure to get this bulletin for your desk.

### High BMEP

We learn, confidentially, that tests are being made with a radial Diesel engine having a combustion chamber designed to produce a b.m.e.p. of 200. This has boosted output importantly, with a consequent increase in power to weight ratio which increases the effectiveness of a Diesel quite beyond its present status.

### On Cutting

One of the best attended exhibits at the recent National Metal Exposition was the machinability demonstration in the U. S. Steel sector. The scientific aspects of machinability still are little known outside of a few laboratories, and this accounted for the wide interest on the part of visiting metallurgists and production men. The demonstration was made with a Gisholt turret lathe fitted with comprehensive instrumentation,

the equipment being fully described in a special bulletin issued by U. S. Steel, available on request. The instruments were arranged to give a visual picture of tool pressure (average), tool pressure (instantaneous), tool temperature on the cutting edge, and measurements of tool life.

### Overdrive

An inventor from Seattle gave us a pleasant ride in a car equipped with a new type of overdrive attachment. It has a direct lock-up for overdrive so that the car is always in overdrive above a certain speed, say, 30 m.p.h. Pushing down on the accelerator cuts in direct speed quickly, smoothly, and silently. This mechanism is said to be quite different from anything that has been used heretofore and in operation, at least, appears to be very satisfactory.

### Die Castings

The people who make zinc die castings can look at the '41 models as a job well done. For the coming model season there are more die-cast items and more tonnage of the high purity zinc alloys than in any other year in the past. More radiator grilles on more makes; more massive ornamental parts on the outside and inside; more die cast sections on instrument panels. This trend bears out the claim made by die casters that the process lends itself to fidelity of decorative treatment, economy in overall cost.—J. G.

### **Trends in the Use Of Nickel Alloys**

**W**IDER USE of existing alloys and the development of new materials, given added impetus by the current huge national defense production program, is shown quite clearly in a survey of trends in alloys which was issued recently by the International Nickel Co., Inc., New York, N. Y. There is a pronounced increase in the use of high strength, low alloy, heat treated steels for aircraft parts, such as tubing for engine mounts and landing gears, propeller blades, propeller shafts, propeller hubs, blade nuts, bolts, gears and connecting rods. More nickel-chromium-molybdenum steel is being adopted by the automotive and aviation industries for stressed parts. These steels often are machined after heat treatment to 450 Brinell, once considered impractical.

Stainless steels of the 18-8 high alloy type are being produced in larger and larger quantities. A recent estimate gives the amount of stainless steel used thus

far in 1940 by West Coast airplane makers for non-structural parts alone at 2,000,000 lb. These corrosion resistant metals also are being used increasingly not only in streamlined trains but in truck construction. A large trailer company has ordered 10,000 stainless steel freight trailer bodies requiring an estimated tonnage of 18,000,000 lb. over a three-year period. New and improved methods for bonding stainless steel to carbon steel are arousing wide interest in clad materials.

Foundries have made marked progress in large volume production of alloyed cast irons. Manufacturers of high quality equipment now are able to depend on thoroughly reliable sources for castings to meet their needs. Builders of machine tools offer outstanding examples. With a heavy demand for their products, they are still able to deliver high quality without being delayed by lack of data of experience in handling complex alloyed cast irons. For large forming dies, the aircraft industry has adopted the same specifications of nickel-chromium irons worked out for automobile bodies.

Among the bronzes, superior materials at reasonable cost have been developed for special applications with mixtures containing from 5 to 15 per cent nickel. Some of these alloys in the "as cast" condition show a strength of 45,000 to 48,000 lb. which, upon heat treating, can be brought up to 75,000 to 80,000 lb. per sq. in. In many fields non-ferrous foundrymen are increasing their use of nickel for the production of pressure tight brass and bronze castings.

There is a broadening of markets for thermostatic bi-metals used to control temperature. These controls, similar to those used in automotive thermostats, make use of nickel-iron alloys containing 36 to 45 per cent for the low expansion side, and 20 to 70 per cent nickel for the high expansion side. Two corrosion resistant alloys in the higher nickel alloy

## *Automotive* **MATERIALS**

# 45

### **Lighter and Stronger**

*This bomb-bay door, which forms part of the under-side contour of bombing planes built by the Glenn L. Martin Co., Baltimore, Md., is made of a new material which combines plywood and plastic. It measures 14 ft. in length, weighs only 41 lb. and will bear more than 3000 lb. Reid B. Gray, chief of the Martin laboratories, Robert L. Hildebrandt, and George W. DeBell developed the door.*



group, previously available only in cast forms, now are being produced in wrought form as well. These alloys, states the International Nickel Co., are Hastelloy C and Illium.

The possibilities of the high-speed nickel plating processes are commanding attention, particularly in the plating of strip, sheet, and wire. This process includes not only straight nickel coatings, but combinations of nickel with other metals. In some cases, the process has been carried out at pilot plants at speeds five times as fast as those now found in automobile plants, at present the widest users of nickel plating.

Of importance in the family of nickel and nickel alloys are those usually associated with rolled nickel, including among others Monel, Inconel, "K" Monel, and "Z" Nickel.

Primarily used to defeat corrosion and to preserve product purity in many industries, rolled nickel and Monel have served a wide range of requirements for over 30 years. They have been recognized as special duty materials. The first step toward a further specialization came almost 10 years ago with the introduction of Inconel—containing approximately 80 per cent nickel, 14 per cent chromium, and 6 per cent iron. Combining most of the characteristics of nickel and Monel, it added an even higher degree of resistance to elevated temperatures, a slightly different range of corrosion resistant properties, unique spring qualities, and other features.

Since the introduction of Inconel additional steps in the production of specialized alloys have come with "K" Monel and "Z" Nickel.

Both are heat treatable to provide strength and hardness usually associated only with some of the heat treatable alloy steels. During the past year there has been a noticeable increase in the use of these alloys.

Still another trend of interest in connection with

this group of alloys is toward the use of Inconel sheet for the construction of carburizing boxes, nitriding furnace linings, carburizing trays, airplane exhaust manifolds, and other applications involving high temperature exposure. In the carburizing boxes, the alloy is replacing much heavier and slower-heating boxes of cast metal.

As the demand for special duty materials grows more urgent, some of the casting alloys are coming more and more to the fore. "S" Monel, non-galling and highly resistant to wear, is said to be forging ahead as an important material for valves, valve trim, liners and similar purposes. Increase in general industrial activity naturally calls on a widening scale for corrosion resistant materials, especially since the requirements everywhere are for equipment offering long life, better performance and improved products.

#### ***Austenitic, Tough, Non-Magnetic Steel Available from Ryerson***

**A**N AUSTENITIC, tough, non-magnetic, abrasion resistant steel known as Manganal and containing 11 to 13½ per cent manganese and 3½ per cent nickel is now carried in stock by Joseph T. Ryerson & Son,

### ***Trends in Nickel Alloys . . . Non-Magnetic Steel . . . Synthetic Rubber Tubing . . . Fast Brass Plating Process . . . Aluminum Bronze Coated Weldrod . . . New Cement With Latex Base***



Inc., Chicago. The 3½ per cent nickel content permits Manganal plates to be welded without a subsequent quenching treatment as there is no loss in toughness on cooling from welding temperature. Welding rod of 18-8 stainless composition has been found to give satisfactory results when used with Manganal.

Manganal is said to have the advantages of 11 to 14 per cent manganese steel in resistance to wear and surface work hardening. Thicknesses up to ½ in. can be sheared. The steel can be flame cut, and requires no subsequent heat treatment when

MATERIALS



formed or punched hot. This characteristic, states Ryerson, gives Manganal a distinct advantage over 11 to 14 per cent manganese steel which must be given a full heating and quenching treatment after forming if the original toughness and ductility is desired—a treatment which often distorts formed shapes.

Chemical composition and physical properties of Manganal are listed, as follows: Carbon, 0.60 to 0.90; manganese, 11 to 13½ per cent; silicon, 0.60 to 0.95; nickel, 2.50 to 3.50; tensile strength, 140,000 to 150,000 lb. per sq. in.; elastic limit, 55,000 to 60,000 lb. per sq. in.; elongation in 2 in., 72½ per cent; reduction of area, 54 per cent.

Hot rolled Manganal steel is carried in stock by Ryerson in 48 by 120 in. plates in the following thicknesses: 3/16 in., ¼ in., ⅜ in., ½ in., ⅝ in. and 1 in.

### **Synthetic Hose for Rigorous Services**

**H**OSE OR TUBING for rigorous service where rubber has been found not completely satisfactory is now being made from Koroseal by the B. F. Goodrich Co., Akron, Ohio. Koroseal, a synthetic elastic material with rubber-like qualities, is plasticized polyvinyl chloride whose basic materials are coke, limestone and salt. The hose is made without fabric or any other wall reinforcement, and is stocked in inside diameters ranging from ⅛ in. to ½ in. and wall thickness from 1/16 in. to ⅛ in.

Properties are given, as follows: durometer hardness, 70 to 78 at 85 deg. Fahr.; specific gravity, 1/31; working pressure 50 lb. at temperatures up to 120 deg. Fahr. A recommended working pressure of 50 lb. per sq. in. is based on a safety factor of five.

The manufacturer advances the following claims for the product; free from sulfur, does not swell in oils, is not affected by strong corrosives, practically impermeable to gas diffusion and does not absorb moisture. Practically free from deterioration due to aging, ozone or other oxidation, including such strong oxidizing agents as potassium permanganate, chromic acid, hydrogen peroxide, sodium perborate, the hose should not be used in contact with food products and softens in temperatures above 150 deg. Fahr. It is claimed that the hose withstands vacuum better than equivalent wall thickness of rubber hose.

### **Speed of Brass Plating Increased by New Process**

**T**HE ELECTROPLATING Division of E. I. du Pont de Nemours & Co. has developed a method of brass plating which it claims will yield smooth bright deposits of controllable thicknesses at a rate of deposition two to four times that achieved by present processes. Heavy deposits of brass, 0.001 in. or more in thickness, can be made in a "reasonable" time where before heavy deposits could not be obtained at all.

The process operates without polarization at high anode current densities, giving proper composition and color of plate and the purity necessary to maintain the efficient operation of the bath. Addition agents prevent pitting, improve lustre and prevent objectionable

fumes. Temperature of operation ranges from 105 deg. to 125 deg. Fahr. A uniform bright yellow color may be obtained over a wide range of current densities, making it possible to achieve uniform color over recessed objects. Characteristics of the deposit may be maintained constantly throughout the process by means of definite chemical control.

A brief comparison of the former practice and the new procedure is as follows:

Brass Plating (Former Practice)		Du Pont High Speed	
Solution Composition		Du Pont High Speed Brass	
Copper Cyanide—4 oz.	per gal.	Salts—3.4 lb.	per gal.
Zinc Cyanide—1¼ "	" "	Addition Agent—2 cc	per gal.
Sodium Cyanide—7½ "	" "		
Sodium Carbonate—2 "	" "		
Operating Condition		Du Pont High Speed Brass	
Anodes: Brass	70-80 per cent Cu	Anodes: Cu	70 per cent—
	30-20 per cent Zn		Zn 30 per cent
Temperature:	75 deg. Fahr.— 100 deg. Fahr.		105 deg. Fahr. to 125 deg. Fahr.
Permissible Anode Current Density—Without polarization	2-4 amp. per sq. ft.	Up to 25 amp. per sq. ft.	
Anode Efficiency—Very poor except at very low anode density		90-95 per cent up to 25 amp. per sq. ft.	
Cathode Current Density:	2-10 amp. per sq. ft.	10-25 amp. per sq. ft.	
Cathode Efficiency:	20-50 per cent	50-80 per cent	

### **Aluminum Bronze in the Form of Coated Weldrod**

**A**LUMINUM bronze in the form of a coated weldrod is now being produced by Ampco Metal, Inc., Milwaukee, Wis. Results of tests comparing physical properties of Ampco-Weld, name of the aluminum bronze weldrod, with older bronze welding materials are, as follows:

Weld Material	Rockwell (B Scale)	Ult. Str. p.s.i.	Elong. % in 2"
Copper-Tin-Lead (80-10-10) .....	83	59,600	9.5
Copper-Tin-Zinc (88-10-2) .....	90	44,300	10.0
Phosphor Bronze .....	90	51,700	18.0
Commercial Bronze (90 Cu, 10 Zn) ..	..	36,500	31.0
Manganese Bronze .....	60	55,000	14-18
*Grade 12 Ampco-Weld .....	63	61,500	24.5
*Grade 16 Ampco-Weld .....	79	87,000	16.3
*Grade 18 Ampco-Weld .....	89	92,500	12.5
*Grade 20 Ampco-Weld .....	94	76,500	8.5
*Grade 21 Ampco-Weld .....	29+	79,500	4.5
*Grade 22 Ampco-Weld .....	38+	96,000	.5

\* Actual test bar of all weld metal. + On C Scale.

"Ampco-Weld" is being used for rebuilding worn cams, gears, dies and bearing surfaces, as well as in original work where the bearing properties and corrosion resistance of the metal can be used to advantage.

### **Goodrich Offers a New Cement with Latex Base**

**T**EXGLUE, a new cement with a latex or rubber base and compounded to afford high adhesive properties and resistance to aging has been developed by the B. F. Goodrich Co., Akron, Ohio. It will attach fabrics, paper and other materials to non-porous surfaces and can be cleaned from these surfaces when its mission is accomplished. Non-inflammable, with no objectionable odor, Texglue can be stored in normal atmospheric temperatures, with avoidance of freezing temperatures or heat above 90 deg.

# WHITE MODEL 102-C BEVEL-GEAR DRIVEN TRUCK AXLE

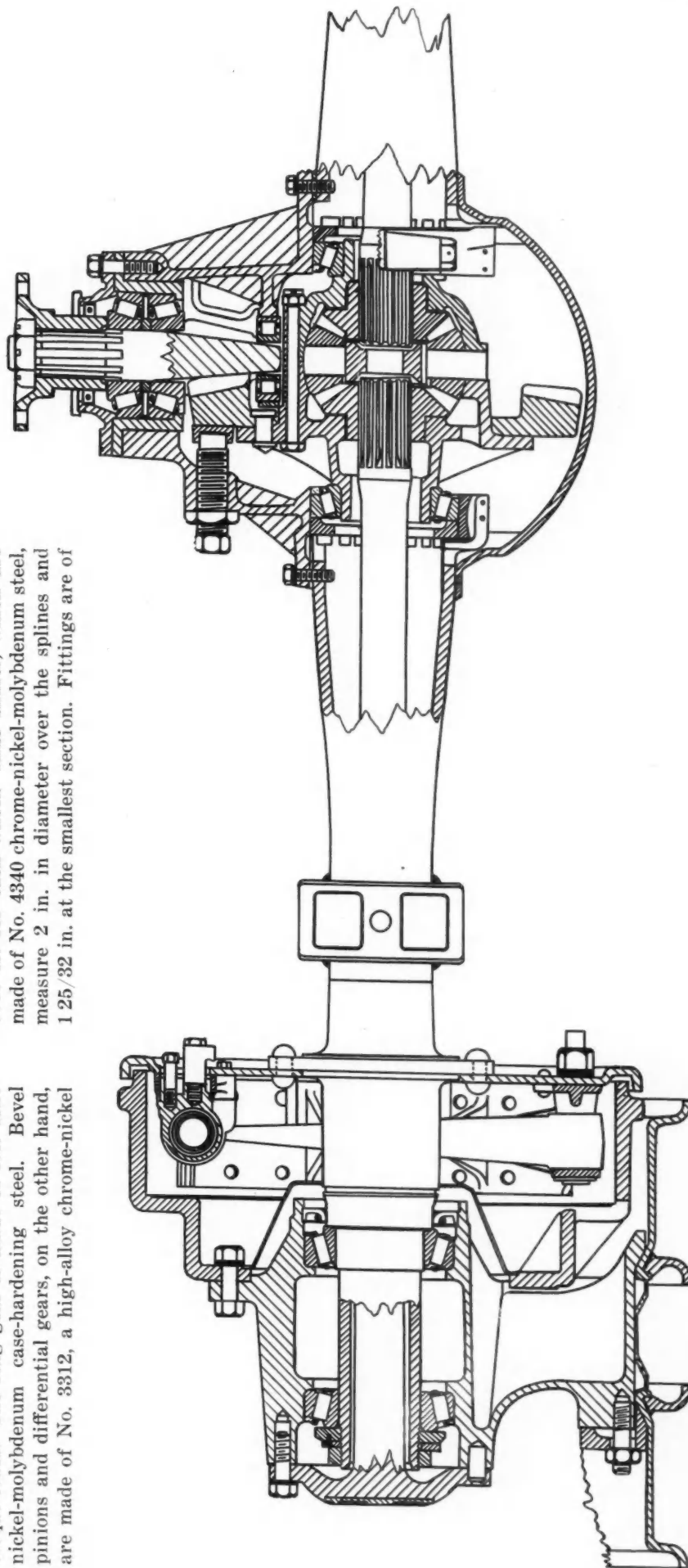
The drawing herewith is of a White full-floating truck axle with single-reduction bevel-gear drive. The axle is made to provide one or another of four different reduction ratios, viz., 5.11, 5.71, 6.43 and 7.17. It will be noticed that the pinion shaft is straddle-mounted and that there is a thrust shoe back of the gear opposite the pinion, to support the gear ring in the event of excessively-high torque loads. The ring gear is made of No. 4820 nickel-molybdenum case-hardening steel. Bevel pinions and differential gears, on the other hand, are made of No. 3312, a high-alloy chrome-nickel

case-hardening steel. The bevel gears have a face width of  $2\frac{1}{4}$  in.

Axle housings are made of pressed steel. At the spring pads the wall thickness is  $7/16$  in., and the outside diameter  $4\frac{13}{16}$  in. Spring centers are spaced  $40\frac{3}{4}$  in. There are two tapered roller bearings in each wheel hub, with a combined radial-load capacity of 8920 lb. and a thrust capacity of 7060 lb. for each wheel. Axle shafts, which are made of No. 4340 chrome-nickel-molybdenum steel, measure 2 in. in diameter over the splines and  $1\frac{25}{32}$  in. at the smallest section. Fittings are of

the 16-spline type. Including brakes and cast wheels, the axle weighs 1024 lb. Its oil capacity is seven quarts.

This axle is standard equipment on the White WA-20, a truck of 18,000 lb. g.v.w. rating, which is equipped with an engine of 318 cu. in. displacement and 250 lb.-ft. maximum torque.



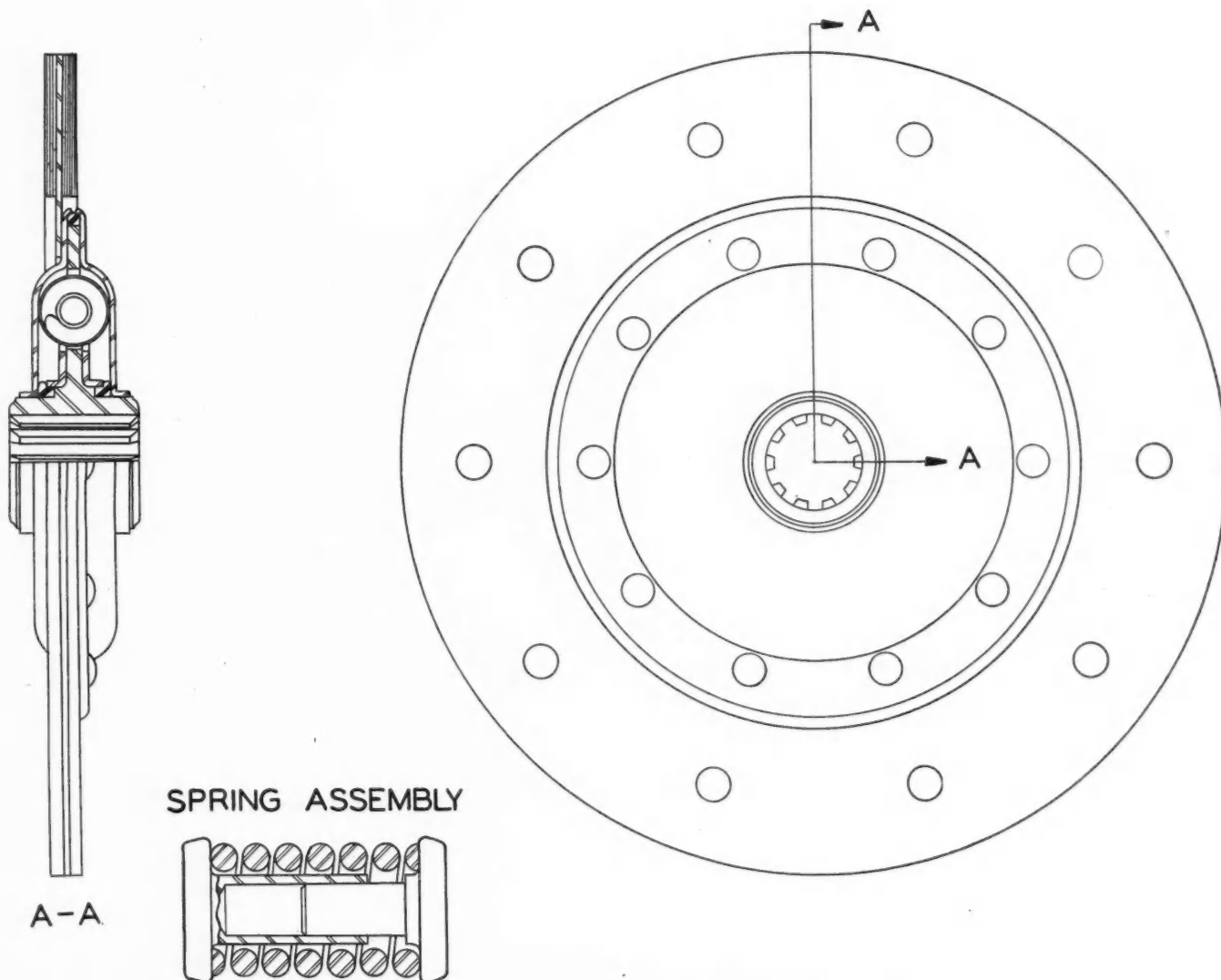
TRANSMISSION DESIGN

## ATWOOD-THELANDER CLUTCH PLATE WITH HYDRO-DAMPER

The drawing below shows the details of the Atwood-Thelander Hydro-Damper clutch plate, which is used in the 8-in. clutch supplied for the Willys Americar by the Auburn Manufacturing Co. Division of Atwood Vacuum Machine Co., Rockford, Ill. As will be noted, the clutch plate has a hermetically sealed cell containing a nest of helical springs fitted with hydraulic plungers. The cell is filled with a grease which con-

trols the movement of the springs.

The damping characteristics of the plate are said to be unique in that the mechanism functions very much like a shock absorber with a hysteresis curve in the form of a triangle, with negligible reaction at the low end and extreme reaction at the upper end. The detail view at the bottom of the page shows the design of the damper cell.





## Automotive Gas Generators Used in USSR

(Continued from page 535)

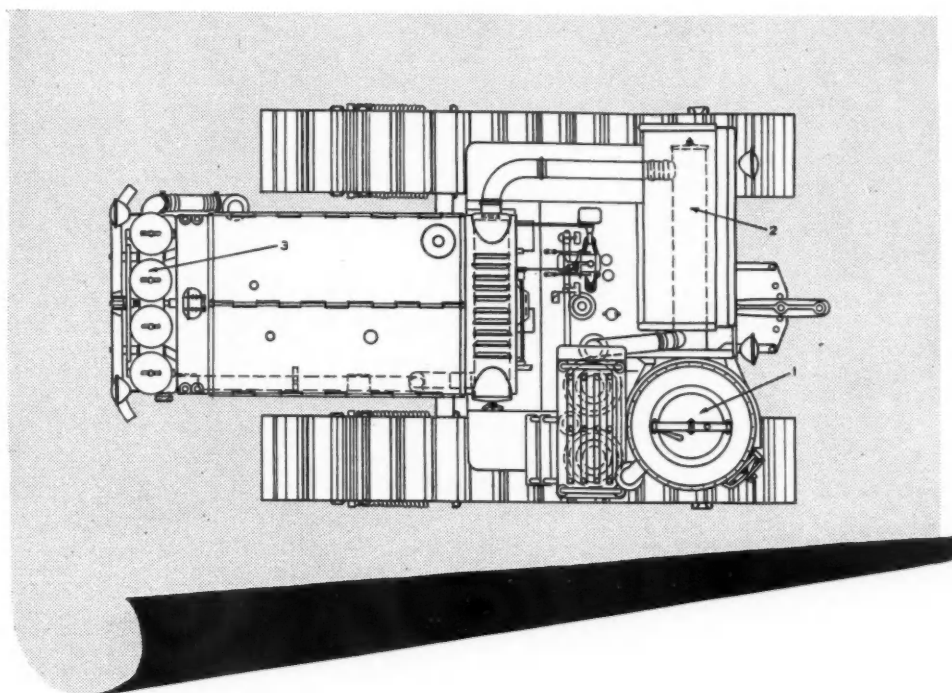


Fig. 3—Plan view of gas-installation on 65-hp. truck-type tractor. 1, gas generator; 2, four scrubbers in the form of cylinders containing diaphragms of perforated sheet metal; 3, four cylinders with Rashig cloth rings for the final purification and cooling of the gas. These latter are located in front of the radiator.

the mixer, where it is combined with the mixture of air and gasoline vapor. The rate of flow of the gasoline-air mixture is then gradually decreased while that of generator gas increases, and finally the engine operates on a mixture of air and generator gas alone. In order to prevent lay-ups due to defects developing in the generator, all Soviet engines are provided with carburetors which make it possible not only to start them but also to operate them for extended periods on gasoline.

The engines used in conjunction with gas generators in the Soviet Union are not specially designed, but are standard gasoline and Diesel engines which have been suitably adapted for the purpose. Gasoline engines are provided with a new cylinder head which gives a compression ratio of 6.5 or 7.0, while Diesel engines are provided with new cylinder heads which reduce the compression ratio from 15.5 to 8.0. Intake and exhaust manifolds also are of new design. The inside diameter of the intake manifolds were increased, to improve the volumetric efficiency of the engine. With the same object in view, the inlet manifold is removed as far as possible from the exhaust manifold, so that the incoming charge will not be heated by the exhaust any more than necessary.

Horizontal-type gas generators are used for charcoal and anthracite. A water-cooled nozzle through which air enters the combustion chamber is located in the lower part of the gas-generator cylinder, at one side.

Water for cooling the nozzle is taken from the engine cooling system. Directly in front of this nozzle there is a grate which covers the gas-outlet and prevents the carrying along of large particles of coal and ash. After leaving the generator, the gas passes

through horizontal cylinders in which it is filtered, particles of diameters ranging from 0.040 to 0.080 in. being eliminated, and is cooled. A more thorough filtration of the gas is accomplished in the vertical cylinder, in which it passes through a layer of coke at the bottom and then through cloth filters (made of flannel-like cloth), which eliminate all of the powder-like substances.

While the automobile-type gas generators were being developed, a certain amount of western European experience was still available, but when working on the tractor-type generators the Soviet engineers were unable to get any outside help and were entirely on their own resources. Gas generators have been developed for two principal types of Soviet tractors, which are now being produced in large numbers.

A particularly interesting application of the gas generator is that to automobiles and tractors in lumber camps, where fuel for the engines is available on the spot. No more liquid fuel will be used in this branch of industry after a not far off date.

The agricultural industry is particularly interested in the possibility of producing motor fuel from straw. The work which has been done on this problem indicates that before long it will be possible to operate agricultural tractors on what might be referred to as "green fodder." The straw, of course, will have to be made into briquettes. The chief problem seems to be to produce strong briquettes which will not crumble in the generator and which will give a gas low in ash and resin content. It is also necessary that the straw be free from dirt, as if it is not it produces a lot of slag.

## Night Scene: U.S.A., 1940

Typical of the currently intense automotive production activity is this dramatic night view of the Chevrolet plant at Flint, Mich. In buildings alive with light, night shift has followed day to speed output of 1941 models. In the foreground and right center of the picture new cars are under way to the shipping division for release to the company's dealer organization.



November 15, 1940

*Automotive Industries*

## NEWS OF THE INDUSTRY

### Estimate Shows 4.2% Gain In Vehicle Registrations

**Statistical Study Indicates that Record - Breaking  
1940 Total Will Surpass Previous Year by 1,300,000**

By MARCUS AINSWORTH

Thirty-one and a half million motor vehicles will have been registered in the United States by the end of 1940—a gain of 1,300,000 over those registered during 1939 and the highest registration of any year in the history of motor vehicles. These facts are divulged by the current results of the survey undertaken annually in November by AUTOMOTIVE INDUSTRIES.

From 1895, when we have our first registration figures of four motor vehicles, up through 1930 when 26,657,072 motor vehicles were registered, each year showed a substantial increase in registrations over the preceding year. The year 1931 showed the first decline from its preceding year and this decline continued for each year through 1933 when 23,849,932 vehicles had been enrolled. Other than a slight decline during 1938 each succeeding year since 1933 has shown a substantial increase with every indication pointing to a banner year of 31,559,723 registrations for the year 1940. During the past decade alone, there has been a marked increase of 5,566,000 cars, trucks and buses since 1931 when 25,993,896 vehicles were registered.

Actual registrations as of the end of the calendar year 1940 will closely approximate 31,559,723 cars, trucks, buses and taxicabs, a gain of 4.2 per cent over the 30,249,014 vehicles registered during 1939. Of this number 27,051,836 will be passenger cars and the remaining 4,507,887 will represent trucks and buses. Passenger cars indicate the greatest increase with a gain of approximately 4.6 per cent over the same period last year while trucks and buses will only show a 1.6 per cent gain.

On the basis of this forecast of total registrations and preliminary data pertaining to the 1940 census of population, there is now one vehicle for every 4.16 persons in the United States as against 4.60 persons during 1930. The passenger cars alone, figuring an average of five persons per car, could trans-

port the present entire population of the country from one locality to another without any difficulty.

Only two states register declines from a year ago and with one of these, New Mexico, the decline is so slight that this might be overcome when final data are released early in 1941. Wisconsin indicates a considerable decline in commercial vehicles but a gain in

passenger cars with a loss in total registrations of 1.2 per cent.

West Virginia shows the largest percentage increase of 9.8, followed by Nevada with 8.8 and Florida with 8.2 per cent. California has leaped to first place in total registrations with 2,770,000, New York dropping to second place  
(Turn to page 559, please)

### New Offices For Toledo Steel Sales Department

The sales division of the Toledo Steel Products Co. has been moved to enlarged office quarters on the twentieth floor of the Second National Bank Building, Toledo, Ohio.

FORECAST OF U. S. MOTOR VEHICLE REGISTRATIONS FOR 1940 \*

	Passenger Cars		Trucks and Buses		Total Motor Vehicles		Per Cent Change
	1940	1939	1940	1939	1940	1939	
Alabama	271,300	251,796	60,560	56,008	331,860	307,804	+7.8
Arizona	110,000	106,924	25,000	24,431	135,000	131,355	+3.0
Arkansas	187,545	179,175	65,199	61,541	252,744	240,716	+5.0
California	2,430,000	2,295,292	340,000	309,855	2,770,000	2,605,147	+6.2
Colorado	331,500	312,847	30,500	30,636	362,000	343,483	+5.6
Connecticut	408,000	385,822	72,000	67,441	480,000	453,263	+6.0
Delaware	59,400	56,744	11,200	11,248	70,600	67,992	+4.0
District of Columbia	157,500	149,745	15,600	14,928	173,100	164,673	+5.1
Florida	413,000	379,868	82,000	77,351	495,000	457,219	+8.2
Georgia	408,738	386,002	94,861	88,236	503,599	474,238	+6.1
Idaho	127,500	121,484	33,000	31,340	160,500	152,824	+4.9
Illinois	1,700,000	1,626,689	230,000	232,868	1,930,000	1,859,577	+4.0
Indiana	872,000	822,946	130,320	130,949	1,002,320	953,895	+5.0
Iowa	655,534	670,080	99,765	93,139	755,299	763,219	+3.0
Kansas	476,000	475,464	100,000	99,008	576,000	574,472	+0.3
Kentucky	389,000	367,215	73,600	70,295	462,600	437,510	+5.6
Louisiana	281,129	267,942	89,502	89,576	370,631	353,518	+5.0
Maine	166,500	157,171	44,000	41,852	210,500	199,023	+5.8
Maryland	384,940	364,064	61,773	59,091	446,713	423,155	+5.8
Massachusetts	804,088	761,363	114,906	111,465	918,994	872,828	+5.2
Michigan	1,095,000	1,031,175	92,000	90,796	1,187,000	1,121,971	+5.8
Minnesota	745,000	721,217	124,940	118,493	869,940	839,700	+3.5
Mississippi	190,370	185,475	59,335	58,611	249,705	244,086	+2.2
Missouri	770,000	734,894	152,000	142,200	922,000	877,094	+5.0
Montana	142,000	135,839	48,000	44,480	190,000	180,319	+5.6
Nebraska	352,000	344,278	66,500	65,805	418,500	410,083	+2.0
Nevada	36,000	32,586	8,300	8,185	44,300	40,771	+8.8
New Hampshire	104,509	102,509	25,464	24,964	129,973	127,473	+2.0
New Jersey	937,491	881,727	143,575	137,810	1,081,066	1,019,537	+6.2
New Mexico	91,918	93,153	28,573	28,488	120,491	121,641	-0.9
New York	2,366,493	2,299,803	346,945	383,206	2,713,438	2,683,009	+1.0
North Carolina	504,200	477,588	67,250	61,999	571,450	539,587	+6.0
North Dakota	145,203	142,384	36,411	34,683	181,614	177,067	+2.4
Ohio	1,800,000	1,702,761	192,000	184,223	1,992,000	1,886,984	+5.7
Oklahoma	481,121	455,771	106,988	100,397	588,109	556,163	+5.8
Oregon	323,843	305,943	72,283	63,387	396,126	369,330	+7.2
Pennsylvania	1,865,787	1,824,567	276,495	274,667	2,142,282	2,099,234	+2.1
Rhode Island	162,867	154,916	23,321	20,152	186,188	175,068	+6.2
South Carolina	272,000	256,574	46,300	44,142	318,300	300,716	+6.0
South Dakota	162,000	158,821	31,615	30,385	193,615	189,206	+2.1
Tennessee	356,400	341,250	65,000	66,242	421,400	407,492	+3.2
Texas	1,337,167	1,281,566	349,849	336,299	1,687,016	1,617,865	+4.1
Utah	115,340	110,980	22,535	21,891	137,875	132,871	+3.7
Vermont	83,000	81,041	9,695	9,672	92,695	90,713	+2.0
Virginia	473,000	383,222	74,900	69,521	547,900	452,743	+7.8
Washington	416,000	449,706	88,800	86,093	504,800	535,799	+5.2
West Virginia	245,963	221,182	49,547	47,169	295,510	268,351	+9.8
Wisconsin	746,500	702,625	86,280	142,206	832,780	844,831	-1.2
Wyoming	67,000	65,309	19,200	18,090	86,200	83,399	+3.5
Total	27,051,836	25,813,495	4,507,887	4,435,519	31,559,723	30,249,014	+4.2

\* Based on actual returns to date plus an estimate for the remaining period of the year as furnished by the motor vehicle commissioners of the various states.



# UAW-CIO Wants Revised Contract With Chrysler

***Demands Include Provisions For Draftees, Vacation Bonus, Union Shop, Wage Adjustments, Change In Seniority Clauses***

Payment of the difference between U. S. Army pay and their weekly wage for conscripted employees will be asked of the Chrysler Corp. by the UAW-CIO when negotiations for a new contract take place later this month. The union has filed notice of desire to amend the present contract, which is subject to renewal Nov. 30.

Other demands to be asked of Chrysler, according to Richard T. Frankenstein, director of the UAW-CIO Chrysler division, are a vacation bonus similar to the week's pay provided in the GM contract signed last June, the union shop, wage adjustments and changes in seniority clauses. The present Chrysler contract was negotiated during the 54-day strike last fall.

Up to early November, no company in the automotive industry had announced a policy of paying the wage differential between army and private industry pay to draftees during their year's service or even the payment of a bonus to draftees, as has been done by a few companies in other industries.

The GM contract with the union provides that any worker called for military service shall accumulate seniority during his absence and that he shall be rehired in a similar capacity if he reports for work within 60 days of his honorable discharge from the army or navy. Briggs Mfg. Co. signed a similar agreement with the UAW-CIO in September, although the period of reinstatement was 40 days.

Among the parts manufacturers, only three plants have expressed an inten-

sion of granting any pay to their employees while in military service. Two plants plan to pay the difference between usual wages and army pay for a limited period, while another company will pay 50 per cent of last year's salary or wages to conscripted workers.

As an example, taking an average annual wage of \$1500 in the automotive industry in Michigan and a base pay of \$21 per month in the army, the difference would amount to \$1,248 per year. If a company had 1000 conscripted workers, payment of this differential would amount to approximately \$1,248,000. With mounting taxes and production costs, it is doubtful if any companies will commit themselves for such a sum, especially with the possibility that war would require conscription of several million men rather than 900,000 per year as now planned. Bonuses are an alternate possibility but guarantees of seniority appear to be the only certain reward for draftees at present. The problem is not yet acute in Michigan, however, as only 617 men will be required for the first call. Nevertheless, subsequent calls will grow proportionately greater.

Although the Chrysler strike is nearly a year past, the compensation case still drags on in the courts. The Michigan Supreme Court is now considering the appeals filed by the Chrysler Corp. and by the UAW-CIO on behalf of 12,000 Dodge workers who were ruled ineligible for benefits by the decision of Judge Leland W. Carr in circuit court last summer. However, a deci-

sion may not be forthcoming for several months.

Intensifying their drive to organize the Ford Motor Co., members of the UAW-CIO distributed pamphlets before the main gates of the company's Rouge Plant on Nov. 1. The day previous, Lila M. Neuenfelt, Dearborn justice of the peace, had declared unconstitutional a Dearborn ordinance banning distribution of handbills on certain busy streets, including the thoroughfare past the Ford Rouge plant. A previous Dearborn ordinance to keep pamphlet distributors off all city streets had been declared unconstitutional by the Michigan Supreme Court.

Justice Neuenfelt ruled the present ordinance an abridgement of freedom of the press and dismissed the charges against Roy J. Thomas, UAW-CIO president, and two other union officials who were arrested in a test case last May 22.

Despite Justice Neuenfelt's decision, Dearborn police arrested 25 UAW-CIO members for violation of the ordinance on Nov. 1. Fourteen of the men brought before Leo R. Schaefer, another Dearborn justice, were ordered for trial Nov. 15, while 11 appearing before Justice Neuenfelt were freed. It is expected that the constitutionality of the measure will be carried to a higher court for decision.

The right of the Ford Motor Co. to distribute circulars among its employees stating the views of Henry Ford was affirmed in U. S. Circuit Court at Cincinnati, Oct. 8. However, in an enforcement decree supporting an NLRB ruling of Aug. 9, 1939, the court ordered the company to cease and desist from interfering with union activity and to reinstate 23 of 24 men allegedly discharged for union activity. Union officers cited this decree in their distribution of handbills.

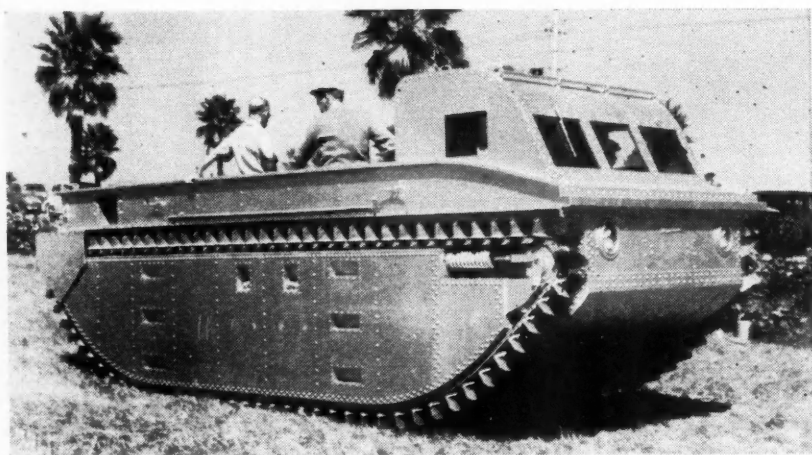
An NLRB vote in the Delco-Remy Division of GM at Anderson, Ind., gave the UAW-CIO 3894 votes and 2398 opposed to any union. This marks the sixty-fourth GM plant in which exclusive bargaining rights have been won by the UAW-CIO.

## Detroit Insurance Executive Temporary Trustee of Hupp

John E. Murphy, Detroit insurance executive, has been appointed temporary trustee of the Hupp Motor Car Corp. by Judge Frank A. Picard in federal court at Detroit. J. Walter Drake, president, filed a petition Oct. 29, for a reorganization of the company. Current assets were listed at \$76,402 against liabilities of \$847,365.

Loss for the September quarter was \$77,407 against \$162,077 a year ago. For the first nine months, net loss was \$221,903 compared to \$641,284 in the same period of 1939. A hearing has been set for Dec. 19 on Murphy's appointment.

At present the company has sub-contracts for parts for Timken-Detroit



Acme

### "Alligator" Tank

This 8000-lb. "Alligator" tank, built by Donald Roebeling of Clearwater, Fla., recently underwent rigid tests before the eyes of U. S. Marine Corps and Navy officials. The duralumin machine went 25 m.p.h. on land and 10 m.p.h. as a watercraft. It is powered by a 125 hp. automobile engine.

Axle Co. and several other companies, employing 150 men at the Detroit plant. Parts of the plant, which contains 1,400,000 sq. ft., have been leased for storage purposes by U. S. Rubber Co. and Packard Motor Car Co.

The management is hopeful of getting some National Defense work if funds can be provided for tooling. The oft-postponed annual meeting is set for Nov. 20 at Richmond, Va.

Last motor car manufactured by the company was the Hupp Skylark, of which 375 were built last spring. The bodies were made and the cars assembled at the Graham-Paige plant but the six-cylinder, 100-hp. engines were made at the Hupp plant.

## NADA Now Affiliated With American Retail Federation

The National Automobile Dealers Association, Detroit, is listed among four other national retail trade associations which have recently become affiliated with the American Retail Federation.

The federation now claims a direct or indirect representation for 400,000 individual retail stores through its 12 national and 27 state retail association members.

## Air Associates, Inc., to Build New California Plant

Air Associates, Inc., will start construction very shortly on a \$200,000 one-story plant at the Los Angeles Municipal Airport. The expansion is the second move of the company in recent months. On Oct. 1 the home office of Air Associates was moved from Roosevelt Field, Long Island, N. Y., to a new half million dollar plant at Bendix Airport, N. J.

# New Defense Tax Law Allows "Accelerated" Depreciation

*Plants Adding "Necessary" Facilities After June 10, 1940 May Amortize Cost Over Five-Year Period*

Procedure for expediting the handling of applications from manufacturers seeking certification under the amortization section of the new excise profits tax law has been worked out jointly by the National Defense Advisory Commission, and the War, Navy and Treasury Departments. Government officials expect the procedure for obtaining rapid depreciation of facilities to materially benefit the defense program.

Under the new tax law, manufacturers in certain cases may use an accelerated rate of depreciation for income and excess profits tax purposes on plants or equipment certified as necessary in the interest of national defense. A manufacturer constructing or acquiring new facilities after June 10, 1940, may in determining his taxes amortize the cost of such facilities over a five-year period instead of the normal period of depreciation of such property if he receives a "necessity certificate."

A manufacturer being reimbursed by the government for the cost of new facilities at a rate exceeding normal depreciation either directly or indirectly will be required to obtain a "certificate of government protection." This certificate will signify that the contract adequately protects the government with reference to future use and disposition of the facilities involved.

A "certificate of non-reimbursement" will be issued to other manufacturers which will conclusively establish for the purpose of the tax law that a "certificate of government protection" is not required. All three certificates require the

approval of the defense commission and either the Secretary of War or the Secretary of Navy. Certification is to be made to the Commissioner of Internal Revenue.

The defense commission announced that instructions covering the information required on applications for these certificates may be obtained from the office of the Assistant Secretary of War or the office of the Judge Advocate General of the Navy. Instructions also are being sent to War Department district procurement officers and will be available to applicants at these offices.

The Bureau of Internal Revenue also has advised manufacturers what they must do in order to charge off the value of new defense plant facilities in five years for tax purposes. The rules to be followed under the amortization provisions of the excise profits tax law were represented by officials as giving a broad interpretation to the law so that a holder of defense contracts may switch from normal to rapid depreciation and even back again to normal if he so elects. Treasury experts emphasized that once a contractor receives the amortization privilege on a piece of defense construction he cannot lose it.

## W. C. Lipe, Inc. Adds to Plant

Construction is now under way on an addition to Plant No. 1 of W. C. Lipe, Inc., Syracuse, N. Y., to provide for expansion of the machine tool division.

## New Passenger Car Registrations

	SEPT.	AUGUST	SEPT.	NINE MONTHS		Per Cent Change, 9 Months, 1940 over 1939	Per Cent of Total Nine Months		TWELVE MONTHS MODEL YEAR		Per Cent Change
	1940	1940	1939	1940	1939		1940	1939	1940	1939	
Chevrolet.....	30,805	55,079	24,099	620,833	448,756	+ 38.8	24.94	22.86	770,418	575,653	+ 33.8
Ford.....	13,771	35,168	18,948	399,762	355,706	+ 12.3	16.06	18.12	525,552	436,251	+ 20.2
Plymouth.....	19,442	22,039	27,943	323,503	282,594	+ 14.4	13.00	14.40	389,716	379,783	+ 2.4
Buick.....	20,186	16,604	9,206	206,521	144,025	+ 43.2	8.30	7.34	281,491	200,011	+ 40.2
Pontiac.....	11,805	11,877	7,248	164,279	109,407	+ 50.0	6.60	5.57	214,708	141,211	+ 52.0
Dodge.....	7,144	14,154	10,153	153,610	149,466	+ 2.6	6.17	7.62	180,729	181,113	- 0.2
Oldsmobile.....	9,083	11,246	6,369	141,002	99,647	+ 41.5	5.66	5.08	187,767	129,209	+ 46.1
Studebaker.....	6,840	6,268	7,778	75,364	58,921	+ 28.0	3.03	3.00	101,103	73,794	+ 37.0
Chrysler.....	3,069	6,009	3,340	72,508	51,895	+ 40.0	2.91	2.64	84,569	64,461	+ 31.2
Mercury.....	2,821	5,495	3,397	60,818	47,434	+ 28.3	2.44	2.42	79,268	54,269	+ 46.0
Hudson.....	7,156	5,599	4,886	59,650	38,273	+ 56.0	2.40	1.95	84,232	50,189	+ 68.0
Packard.....	5,342	6,028	6,796	55,257	38,892	+ 42.0	2.22	1.98	76,368	52,572	+ 49.0
De Soto.....	3,392	5,611	3,620	54,024	42,291	+ 28.0	2.17	2.15	63,684	51,764	+ 23.0
Nash.....	2,182	3,558	3,770	39,728	40,148	- 1.1	1.60	2.05	53,632	47,370	+ 13.3
Willis.....	1,386	1,910	942	16,572	8,946	+ 85.0	.67	.46	22,360	12,007	+ 85.6
La Salle.....	1,044	1,492	837	15,933	15,454	+ 3.0	.64	.79	22,676	21,304	+ 6.3
Lincoln.....	1,040	1,498	1,086	15,541	14,643	+ 6.1	.62	.75	20,638	18,821	+ 10.6
Cadillac.....	711	619	656	8,752	9,384	- 6.6	.35	.48	12,458	12,533	- 0.6
Graham.....	206	237	225	1,325	3,410	- 61.2	.05	.17	1,575	4,312	- 63.4
Bantam.....	55	62	701	321			.03		953		
Crosley.....	30	34	321	867			.01		133		
Hupmobile.....	19	34	51	93		- 89.2		.04	133	1,014	+ 87.0
Miscellaneous.....	471	410	283	2,994	2,519	+ 19.0	.13	.13	3,083	2,914	+ 5.8
<b>Total.....</b>	<b>148,000</b>	<b>211,031</b>	<b>141,633</b>	<b>2,489,091</b>	<b>1,962,676</b>	<b>+ 27.0</b>	<b>100.00</b>	<b>100.00</b>	<b>3,179,792</b>	<b>2,509,555</b>	<b>+ 26.8</b>
Chrysler Corp.....	33,047	47,813	45,056	603,645	526,246	+ 14.5	24.25	26.81	718,698	677,121	+ 6.0
Ford Motor Co.....	17,632	42,161	23,431	476,121	417,783	+ 14.0	19.13	21.29	625,658	509,341	+ 23.0
General Motors Corp.....	73,634	96,917	48,415	1,157,320	826,673	+ 40.0	46.50	42.12	1,489,518	1,078,921	+ 38.0
All Others.....	23,687	24,140	24,731	252,005	191,974	+ 31.4	16.12	9.76	345,918	244,172	+ 42.0



## New Passenger Car Registrations and Estimated Dollar Volume by Retail Price Classes\*

PRICE CLASS	NEW REGISTRATIONS								ESTIMATED DOLLAR VOLUME							
	SEPTEMBER				NINE MONTHS				SEPTEMBER				NINE MONTHS			
	Units		Per Cent of Total		Units		Per Cent of Total		Dollar Volume		Per Cent of Total		Dollar Volume		Per Cent of Total	
	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939	1940	1939
Chevrolet, Ford and Plymouth.....	64,018	70,990	43.40	50.14	1,344,098	1,087,056	54.07	55.41	\$49,000,000	\$52,300,000	37.23	42.88	\$1,028,000,000	\$795,900,000	47.75	47.91
Others under \$1,000.....	56,923	53,966	38.58	38.12	802,507	695,701	32.28	35.46	51,500,000	48,700,000	39.13	39.93	725,800,000	636,600,000	33.71	38.32
\$1,001 to \$1,500.....	25,338	15,213	17.17	10.75	322,159	150,148	12.96	7.65	28,700,000	18,100,000	21.81	14.84	364,600,000	175,140,000	16.93	10.54
\$1,501 to \$2,000.....	893	569	.61	.40	11,046	19,021	.44	.97	1,600,000	917,000	1.22	.75	19,195,000	29,200,000	.89	1.76
\$2,001 to \$3,000.....	357	809	.24	.57	6,216	9,501	.25	.48	800,000	1,800,000	.61	1.48	15,018,000	21,600,000	.70	1.30
\$3,001 and over.....		31		.02	71	618		.03		144,000		.12	340,000	2,800,000	.02	.17
<b>Total</b> .....	<b>147,529</b>	<b>141,578</b>	<b>100.00</b>	<b>100.00</b>	<b>2,486,097</b>	<b>1,962,045</b>	<b>100.00</b>	<b>100.00</b>	<b>\$131,600,000</b>	<b>\$121,961,000</b>	<b>100.00</b>	<b>100.00</b>	<b>\$2,152,953,000</b>	<b>\$1,661,240,000</b>	<b>100.00</b>	<b>100.00</b>
Miscellaneous.....	471	55			2,994	631										
<b>Total</b> .....	<b>148,000</b>	<b>141,633</b>			<b>2,489,091</b>	<b>1,962,676</b>			<b>\$131,600,000</b>	<b>\$121,961,000</b>			<b>\$2,152,953,000</b>	<b>\$1,661,240,000</b>		

\* All calculations are based on delivered price at factory of the five-passenger, four-door sedan, in conjunction with actual new registrations of each model. The total dollar volumes are then consolidated by price classes.

## Automobile Men Study Aircraft Blueprints

### Spend Time With Automotive Committee For Air Defense In Preparation For Bidding On Wing and Fuselage Parts Order

Representatives of 70 companies, approximately 10 per cent of those invited to inspect aircraft plans, parts and blueprints, visited the permanent headquarters of the Automotive Committee for Air Defense in the administration building of the Graham-Paige Motors Corp. during the first week of its establishment there. The headquarters were set up following the meeting of representatives of the automobile industry with William S. Knudsen, of the National Defense Advisory Council, Oct. 25, at Detroit, under auspices of the Automobile Manufacturers Association.

These preliminary visits were intended to acquaint the various manufacturers and tool and die makers with the character of the work involved when it comes time to bid for work on the \$500,000,000 order for aircraft wing and fuselage parts which Knudsen asked the industry to undertake.

Clarence C. Carlton, president of the Automotive Parts and Equipment Manufacturers, Inc., and vice-president of Motor Wheel Corp., is serving as temporary director of the Automotive Committee for Air Defense pending selection of a permanent director. He is being assisted by W. F. DeGroat, a veteran aeronautical engineer who will serve as technical advisor for the committee. DeGroat formerly was chief engineer for the Barkley-Grow Division of Aviation Mfg. Corp.

New members appointed to the committee are Irving B. Babcock, president of Yellow Truck & Coach Mfg. Co., representing the truck industry, and William P. Brown, president of Briggs Mfg. Co., representing the body builders.

Maj. James H. Doolittle, former

speed pilot, is superintending the work for the U. S. Army Air Corps, assisted by several other officers from Wright Field, Dayton, Ohio. Two plane loads of parts from Wright Field and the Glenn L. Martin plant at Baltimore have been flown to Detroit for display to the manufacturers.

It is understood that the two bombers on which the automobile industry will standardize for parts are the B-24 four-engine bomber of the Consolidated Aircraft Corp., of which 4000 will be made, and the B-26 two-engine Martin bomber, of which 8000 will be turned out.

Packard Motor Car Co. is rushing both its aircraft and marine engine expansion programs. Work is progressing on the administration, main assembly and metallurgical laboratory building, which will be completely air-conditioned and equipped with fluorescent lighting.

It will contain 235,500 sq. ft. A building for heat treating and machine shops, costing \$496,000 and containing 119,000 sq. ft., also is under way. Forty sound-proof test sheds nearby will cost \$50,000 apiece, of which \$10,000 will be for sound-proofing each one. More than \$18,000,000 is being spent for machine tools for the Rolls-Royce engine production.

An additional \$700,000 is being spent for tooling to expand the capacity of the marine engine division to five per day. At present the rate of output is a little more than one engine per day. The 1350-hp. V-12 engines are being made for the U. S., Great Britain and Canada.

Packard's recent quarterly report revealed \$20,781,800 paid in advance on marine and aircraft orders and \$20,000,000 deposited by a "customer" for acquisition of machinery, tools and plant rearrangement. This amount presumably was paid by Great Britain as part payment for 6000 of the Rolls-Royce Merlin engines.

The Ford Motor Co. was awarded formally a contract for \$122,323,020 on Nov. 6 for the manufacture of 4000 Pratt & Whitney double Wasp radial aircraft engines. The \$11,000,000 plant

### Warsaw Taxis

These two-passenger taxis are now seen on the streets of conquered Warsaw where gasoline is a precious commodity. The vehicles are equipped with a meter and are propelled by the driver by means of pedals. (Passed by the German Censor).



Acme





Acme

### R. E. Griffin

... who has been appointed to the new position of production manager for Oldsmobile. Mr. Griffin, formerly distribution manager, is succeeded in that position by T. R. Taffee, while L. F. Culver, distribution manager at the Linden, N. J. assembly plant, becomes assistant distribution manager.

for this job is now under construction and the company has opened a 60-day training course for youths at the Rouge plant so they will be acquainted with aircraft production methods when the plant opens next April.

Ford engineers also are experimenting with a liquid-cooled twin-six aircraft engine of their own design which may be put into production after the Pratt & Whitney order is completed. This engine develops 1650-hp. Henry Ford told one interviewer that the engine was adaptable to peacetime use.

"We may have to use it in a truck," Ford said, then added, "that's not so strange, either," when he was questioned as to the advisability of using such a powerful engine on the road. "You may be amazed at the type of truck which the future will bring."

Bendix Aviation Corp. is going forward with the tooling of its new plant at Wayne, Mich., which it acquired from the Graham-Paige Motors Corp. The plant, which Graham formerly used for making automobile bodies, contains 265,000 sq. ft. on a 40-acre plot. It will become one of the group of six Bendix plants which are playing an important part in the National Defense program. The Detroit plant will employ about 1500 men when it gets into production some time after Jan. 1.

Additional orders for ammunition components totaling \$9,415,595 to the Budd Wheel Co. have boosted that

company's National Defense work over the \$20,000,000 mark. Other new orders to automotive firms include \$8,820,040 to Willys-Overland Motors, Inc., Toledo, for ammunition components; \$584,750 to Federal Motor Truck Co., Detroit, for truck-tractors; \$1,335,581 to Yellow Truck & Coach Mfg. Co. for trucks; \$236,914 to Chevrolet for trucks, and \$2,298,000 to Federal Screw Works, Detroit, for ammunition components.

### New Contract Awarded for Guiberson Diesel Engines

The Rock Island Arsenal has awarded a contract to the Guiberson Diesel Engine Co. for radial type Diesel engines in the amount of \$3,888,705.73. The engines are to be used in the light U. S. Ordnance tanks. The Diesels will be manufactured by The Buda Co. at Harvey, Ill., under an exclusive manufacturing agreement with the Guiberson Diesel Engine Co.

The Buda Co. has just completed a new Diesel engine plant for the manufacture of the Guiberson type engines and is now completing the installation of machines, tools and necessary equipment for the manufacture of eight of the Guiberson engines per day beginning Jan. 1, 1941. This last order for engines, together with other orders for engines now being manufactured, will fill the capacity of the new Buda company plant for all of the year 1941.

### Recommended Revision For Gage Blank Standard

The Division of Trade Standards of the National Bureau of Standards is circulating among producers, distributors and users of gage blanks, prior to publication by the bureau, a Recommended Revision of Commercial Standard CS8-33, relating to gage blanks.

The revision proposes new standards for thread setting plug gages, taper thread ring gages, dial indicators, and master discs. Standard designs with-

out complete specification for dimensions are proposed for spline plug and ring gages, taper plug and ring gages, flush-pin gages, special snap gages, and flat plug gages. Adjustable length gages are completely revised, while the remainder of the changes are minor.

### U. S. Steel Export Co. To Handle Kennametal

The McKenna Metals Co., Latrobe, Pa., has announced completion of arrangements under which the United States Steel Export Co. will sell Kennametal tools, tool blanks, drawing dies and wear-resisting parts to foreign markets.

The new arrangement does not affect the sales agreement in effect with the George H. Alexander Machinery, Ltd., Birmingham, England, who have the British patent rights to Kennametal and are the sales agents for Great Britain and British possessions; nor does it affect the manufacture and sale in Canada, which are carried on by Kennametal of Canada, Ltd., Hamilton, Ontario, Canada.

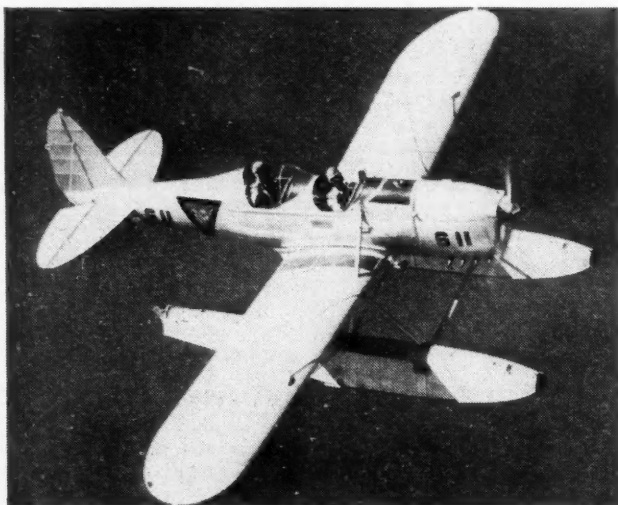
### Copperweld Expands Warren, Ohio, Plant

Copperweld Steel Co. has announced that construction is now well under way on one additional 25-ton and one additional 10-ton top charging electric furnace at its Warren, Ohio, alloy steel plant. Upon completion of these two new furnaces in January, 1941, the company will have in operation three 25-ton furnaces and one 10-ton furnace for the production of all grades of alloy steels.

The company recently added two additional heat treating furnaces, bringing the total heat treating capacity up to 1200 tons per month, and two additional annealing furnaces bringing annealing capacity up to 3000 tons per month.

### New Truck Registrations

	September	August	September	NINE MONTHS		Per Cent Change, 9 Months 1940 over 1939	Per Cent of Total Nine Months	
	1940	1940	1939	1940	1939		1940	1939
Chevrolet	11,394	17,053	9,132	144,006	127,774	+ 13.0	33.47	34.53
Ford	10,804	12,380	7,288	118,905	87,351	+ 22.2	27.64	26.30
International	7,081	7,387	6,287	59,155	48,819	+ 21.2	13.75	13.19
Dodge	3,488	4,724	4,169	42,510	40,497	+ 5.0	9.88	10.94
G. M. C.	3,204	3,900	3,091	32,441	25,566	+ 27.0	7.54	6.91
Plymouth	434	685	439	7,589	7,106	+ 7.0	1.76	1.92
Mack	639	661	556	5,522	4,789	+ 15.4	1.28	1.29
White	551	470	483	5,016	3,410	+ 47.0	1.17	.92
Diamond T	530	587	496	4,890	3,812	+ 28.2	1.14	1.03
Willys-Overland	206	214	99	1,891	1,153	+ 64.0	.44	.31
Divco	133	150	64	1,287	1,046	+ 23.0	.30	.28
Federal	134	121	159	1,222	1,167	+ 5.0	.28	.32
Autocar	134	112	191	1,221	1,598	- 23.3	.28	.43
Brockway	131	137	157	1,119	1,359	- 17.7	.26	.37
Studebaker	74	92	165	931	1,712	- 45.6	.22	.46
Hudson	34	34	11	575	356	+ 61.4	.13	.10
Reo	99	93	18	324	817	- 60.4	.08	.22
Bantam	18	16	59	318	446	- 28.8	.07	.12
Sterling	22	30	23	247	254	- 2.8	.06	.07
F. W. D.	18	24	12	197	137	+ 43.8	.05	.04
Miscellaneous	96	100	74	867	910	- 4.7	.20	.25
Total	39,224	48,980	32,983	430,235	370,079	+ 16.1	100.00	100.00



Acme

### Training Plane

This is the first Ryan S-T training plane to be equipped as a seaplane. The seaplane trainer, called the STM-2, is a low-wing, open-cockpit monoplane of metal construction. It is powered with a 150-hp. air-cooled, in-line engine.

## Car Makers Maintain Steady Steel Buying

### Furnish Major Support For Peak Rate Of Production By Automatic Continuous Rolling And Finishing Equipment

In sharp contrast with the hectic purchasing program that some of the steel buyers, usually classified as miscellaneous consumers, have apparently set for themselves, automobile manufacturers as well as parts makers, heavy as their requirements are, continue to pursue the even tenor of their ways. Especially smaller buyers in lines that, if a rigid priority system were to be set up, would have to take their chances at the tail-end of the procession, are clamoring to have steel producers accord them some sort of protection on first quarter 1941 shipments, though the price be put down as that prevailing at the time of shipment and sellers assume no more obligation than to enter the order on their books. Even at that, steel producers look askance at this type of buying and are doing everything possible to discourage it.

Sheet and strip steel business, placed by automobile manufacturers, furnishes the major support for about as high a rate of operations as the automatic, continuous rolling and finishing equipment can endure for any length of time without having to resort to too frequent interruptions for reconditioning. In most mills, the prevailing operating rate of these continuous units is appraised at 80 per cent of capacity, but operations in excess of that could hardly be maintained for any length of time. According to the American Iron & Steel Institute, the industry operated during the week ended Nov. 9 at the rate of 96 per cent of ingot capacity, compared with 95.7 per cent in the preceding week. This, it is generally recognized, is virtually the peak, even though some units may be operating at a higher level than their rated ingot capacity, which takes into consideration time needed to put equipment back into con-

dition, following a certain number of days' runs.

Spirited inquiry for alloy steel plates is thought to reflect covering by some of their initial material needs against contracts for national defense items. The pig iron price situation, disturbed for a time as the result of a mark-up by one producer, has calmed down with assurance by the leading interests that there is no need at this time to fear any "undue" increase in the price set-up. A number of outmoded merchant furnaces are back in production for the time being, thus helping to keep prices on an even keel. The head of a large steel company voiced the opinion a few days ago that steel prices, as at present in effect, were satisfactory alike to producers and consumers and that every one hoped this situation would continue.

Formal announcement of a reduction in the price of aluminum from 18 to 17 cents a pound, effective Nov. 18, 1940, was made by the sole producer of that metal a few days ago. This is expected to exert a restraining influence on the price movement of copper, with which metal aluminum is competitive

in a number of important uses. This influence is offset by efforts on the part of high-cost copper producers to silence opposition to a rise in the price of the red metal, so that mines, that have long been idle because they can not be worked profitably in normal times, may again be operated. Copper prices continue unchanged, with the large producers quoting spot electrolytic at 12 cents a pound and a premium of from \$10 a ton upwards asked by the outside market.

The fresh supply of tin in the first 10 months of 1940 reached the record-breaking total of nearly 94,000 tons, while consumption in that time is estimated to have been 60,000 tons, so that some 33,000 tons were added to stocks. This favorable position tends to keep the market easy at 51 cents for spot Straits.—W. C. H.

### Ex-Cell-O Expanding Its Aircraft Program

Expanding its aircraft parts manufacturing program, Ex-Cell-O Corp. has purchased a 15-acre plant site containing a two-story brick factory building within a quarter mile of its Detroit plant. The building contains 125,000 sq. ft. of floor space and will increase Ex-Cell-O's available floor space to 355,000 sq. ft.

Remodeling of the plant and installation of machinery are now under way and production is expected to start almost immediately. The new addition will boost employment by 1300 men, increasing payrolls to 4000 workers. The \$3,000,000 expansion program will be financed by term bank loans.

Profits for the first nine months of 1940, before federal income and excess profits taxes, were \$2,835,053 compared to \$646,415 for the same period last year.

### Census Shows Piston Rings Lead in Replacement Sales

Based on returns from 460 companies, sales of automotive accessories and replacement parts for 1939, as compiled by the Bureau of the Census, were led by piston rings, the total number sold amounting to 170,674,395 units. Incandescent light bulbs came next with

### Truck Production by Capacities (U. S. and Canada)

	NINE MONTHS				
	UNITS			Per Cent of Total	
	1940	1939	Per Cent Change	1940	1939
1½ Tons and less.....	543,351	489,774	+ 11.0	88.79	91.59
2 to 3 Tons.....	40,117	25,317	+ 58.2	6.55	4.73
3½ Tons and over.....	11,602	10,110	+ 15.0	1.90	1.69
Special and buses.....	5,728	4,462	+ 28.2	.94	.63
Station Wagons.....	11,167	5,144	+117.0	1.82	.96
<b>Total.....</b>	<b>611,965</b>	<b>534,807</b>	<b>+ 14.8</b>	<b>100.00</b>	<b>100.00</b>



82,799,688 units, while spark plugs followed with 78,200,527 units; cylinder head gaskets with 17,762,626 units; and storage batteries with 12,352,256 units.

The special survey, conducted at the request of the Automobile Manufacturers Association and the Automotive Parts and Equipment Manufacturers, Inc., was designed to provide manufacturers in the automotive field with information on the physical volume of sales of accessories and replacement parts in the domestic market. In the interest of simplicity, dollar values were not requested.

List of items was limited to important accessories and to parts sold in large volume in the replacement market.

## Standards Bureau Devises a New Test of Stainless Steel

A new testing method for ascertaining its maximum compressive strength is expected by the Bureau of Standards to increase the use of stainless steel in the manufacture of aircraft and possibly to appreciably speed airplane production.

"Stainless steel possesses high strength and is very resistant to corrosion," said Dr. Lyman J. Briggs, director of the bureau. "With a full knowledge of its compressive properties, engineers need no longer hesitate to consider the use of this widely available material for aircraft and other light-weight structures."

Part of a research project undertaken for the National Advisory Committee for Aeronautics and financed by eight different manufacturers, the special test was designed to eliminate the difficulty of buckling under stress when compression tests are made on thin sheets of stainless steel. A test specimen of many pieces stacked side by side in playing-card fashion, cemented together and supported to prevent lateral buckling, was described by bureau engineers as making possible the testing of steel sheets .002 in. in thickness under a load of 110 tons per sq. in.

## Casing Shipments Up 8.1% in September

Automotive pneumatic casing shipments during September exceeded August shipments by 8.1 per cent, according to The Rubber Manufacturers Association, Inc. September casing shipments totaled 4,511,664 units as compared with 4,173,508 units shipped in August and 5,658,126 units shipped in September 1939.

## New \$500,000 Factory For Houde At Buffalo

The Houde Engineering Corp. will construct a \$500,000 plant in Buffalo, N. Y., to manufacture precision automobile, tank and aircraft parts for the national defense program. Reports indicate the company has acquired a 38-acre site and that ground soon may be broken for the structure.

# Graham-Paige Suspends Automobile Production

## Will Use Part Of Dearborn Plant To Build Naval and Military Engine and Ordnance Parts

Suspending automobile production until the national defense emergency passes, Graham-Paige Motors Corp. is retooling part of its Dearborn plant for the manufacture of naval and military engine and ordnance parts. The backlog on this work amounts to about \$6,000,000, according to Jos. B. Graham, president. Approximately 200 skilled workers are now employed in tooling the plant and readying it for this production. More men from the plant's labor list will be recalled when production is ready to start within several months.

The Chrysler Corp. has leased 600,000 sq. ft., approximately half of the space available, in Graham's main plant at Dearborn to carry on Chrysler's expanding national defense work. Graham will utilize the rest of the space for its own production on both direct contract and subcontract from other manufacturers. The company, which obtained a \$2,000,000 R.F.C. loan last spring, reported a net loss of \$460,944 for the September quarter against a net loss of \$360,763 for the same quarter a year ago. Loss for the first nine months was \$1,016,596 compared to a loss of \$1,077,104 for the same period of 1939. It is understood that \$2,500,000 is being advanced for tooling by customers ordering engine and ordnance parts.

Graham has not produced any motor cars since early September, being faced with the problem of national defense priorities and inability to obtain important parts needed for production. President Graham is hopeful of resuming production of the Hollywood model when material and parts are again easily obtainable from suppliers.

Part of the Graham administration building is being leased to the Automotive Committee for Air Defense, while space also has been leased to Tucker

Aircraft Corp. for office use and experimental work. Tucker has a \$5,900,000 national defense order for power driven gun turrets for bombers and a \$201,000 experimental order for a liquid-cooled aircraft engine developed by Harry Miller, racing car designer.

## C. L. Allen

Charles L. Allen, 82, chairman of the board of Norton Co., Worcester, Mass., and general manager of the company for 48 years until he retired from that office in 1933, died on Nov. 4.

## Registrations

(Continued from page 553)

with 2,713,428 followed by Pennsylvania in its same relative position as last year with 2,142,282 motor vehicle registrations. Ohio, Illinois, Texas, Michigan, New Jersey and Indiana, in the order named are the remaining states with over one million registrations.

This forecast, a yearly feature, is made possible through the cooperation of the motor vehicle commissioners of the various states. Actual data are secured for the first nine or ten months of the year and an estimate is made up for the remaining period of time. The total estimate is based on returns from 41 states out of the 48 states and the District of Columbia. In this estimate we endeavor to lean on the conservative side though sometimes we err in those states for which we receive no returns. Our forecast for 1939 registrations was within 160,582 on the plus side of the actual final returns, an error of about five-tenths of one per cent. In 1938 we were within three-tenths of one per cent of the final returns.

## Sea-Going Tug

George W. Codrington, president of Cleveland Diesel Engine Division of General Motors, (right) stood his trick at the controls of this new 103-ft., Diesel powered Navy sea-going tug, named in his honor, during recent trial runs at Port Arthur, Tex.



Acme



## Business in Brief

*Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES*

Renewed expansion of general business activity apparently continues. The index of *The Journal of Commerce* for the week ended Oct. 26, without adjustment for seasonal variation, established an all-time record, 115.0 per cent of the 1927-29 average, as compared with 114.0 for the preceding week. The *New York Times* adjusted index for the same period rose more than a full point to 109.3 per cent of the estimated normal, a peak for the current year to date, as compared with 104.4 a year ago.

Retail sales during week ended Nov. 2, according to the Dun & Bradstreet estimates, were from six to 12 per cent above corresponding levels in 1939. Department store sales during the preceding week were six per cent above the comparable total last year, according to the Federal Reserve compilation.

Production of electricity by the light and power industry during the week ended Oct. 26 rose to an unprecedented level, 6.8 per cent greater than the output a year ago.

The movement of railway freight in the same period, expanding contrary to the usual seasonal trend, was the year's maximum to date. The number of cars loaded, 837,651, was 2.9 per cent greater than the figure for the week before and one per cent more than the loadings last year.

Business failures during the week

ended Oct. 24 numbered 263, as compared with 262 in the preceding week and 277 a year ago, according to the Dun & Bradstreet tabulation.

Crude oil production during the week ended Oct. 26 declined moderately to an average of 3,640,300 barrels daily but was 59,700 barrels more than the required output as computed by the Bureau of Mines.

Average daily output of bituminous coal in the same period was 1,458,000 tons, as against 1,368,000 tons for the week before and 1,738,000 tons a year ago.

Engineering construction contracts awarded during the final week of October totaled \$157,754,000, as against \$50,040,000 in the comparable period last year, according to *Engineering News-Record*. For the year to date, the total is 25 per cent above the corresponding 1939 figure.

Professor Fisher's index of wholesale commodity prices held steady during the week ended Nov. 4 at 83.3 per cent of the 1926 average, as compared with 83.4 a fortnight earlier.

Excess reserves of the member banks of the Federal Reserve system declined \$10,000,000 in the week ended Oct. 30 from the estimated all-time peak of \$6,940,000,000. Business loans of the reporting members increased \$24,000,000 during the preceding week and stood \$454,000,000 above the total a year ago.

taxes, was \$52,342,597 in 1939. This was 15.1 per cent on the average stockholders' investment. The rates for individual corporations ranged from a loss of 6.9 per cent to a gain of 25.9 per cent. The net income on the corporate net worth investment, or stockholders' equity, after provision for income taxes, was \$42,739,648 last year. This was approximately 12.3 per cent of the average stockholders' investment.

The combined net income, before deduction of interest on long-term borrowings and income taxes, on the total capital of \$369,606,757 in 1939, was \$53,460,717, or a rate of return of 14.5 per cent on the average of such total employed capital for the year. In comparison, the rate of return on the average capital during 1938 was 1.9 per cent.

### Wheel & Rim Assoc. Back in Detroit

The National Wheel & Rim Association offices were returned to Detroit on Nov. 1. Special duties which motivated the removal to Dayton, Ohio, last February have been completed. The Association's new quarters are located at 16883 Wyoming Ave. E. S. Ingham continues as secretary and general manager.

### Colonial Broach Co. Building New Plant

Ground has been broken on Hoover Road, Detroit, for the construction of a new plant by Colonial Broach Co. The plant, which will comprise some 20,000 sq. ft. of manufacturing space, will provide increased facilities for manufacture of broaching machines, jigs, and fixtures. The new machinery plant is expected to go into operation about Jan. 1.

### Wilcox-Rich and Chevrolet To Build Plant Additions

Chevrolet plans construction of a new \$275,000 driveaway building in Flint. It will be a two-story brick structure, 330 by 132 ft., so designed that two additional floors can be added. The reinforced concrete floor construction will be of a novel design heretofore seen only in England. The building was designed by Albert Kahn.

Wilcox-Rich division of Eaton Mfg. Co. will build a 186 by 120 ft. addition to its Saginaw plant to accommodate the manufacture of aircraft engine parts.

### Biow Sets Up Agency In Washington, D. C.

A new agency, designed to furnish national manufacturers and business men with sales representation in Washington, D. C., has been established by Irving E. Biow, formerly associated with the Washington office of the Federal Housing Administration.

## Ourselves & Government

### A Check List of Federal Action Corrected to Nov. 8

#### FEDERAL TRADE COMMISSION

GM EXCLUSIVE DEALER CASE. Final arguments made Oct. 15. Case taken under advisement.

FORD SIX PER CENT CASE. United States Circuit Court of Appeals Sixth Circuit (Cincinnati), on Oct. 18 denied motion for order requiring the commission to certify as a part of the record the trial examiner's report and exceptions taken to it.

FAIR TRADE PRACTICE RULES for the automobile industry are still described by FTC officials as being on the active list of subjects under advisement by the commission.

### Parts and Accessories Sales Up 29.9% in '39

Combined total net sales for 1939 of 19 of the most important manufacturers of automobile parts and accessories amounted to \$563,770,843, an increase of 29.9 per cent over 1938, according to a Federal Trade Commission report.

Net incomes, after payment of income taxes, was \$42,572,967 last year, comparing with \$3,636,995 in the earlier year, while the respective cash dividends on preferred shares were \$964,682 and \$1,001,121. Cash dividends on common shares were \$28,117,502 in 1939 and \$9,974,843 in 1938. The cash dividends represented returns of approximately 8.4 and 3.1 per cent, respectively, to stockholders on the average ledger value of their equity of \$346,528,539 in 1939 and \$346,148,718 in 1938.

The net income on the corporate net worth investment, or stockholders' equity, before provisions for income

## CALENDAR

### Conventions and Meetings

- American Society of Mechanical Engineers, Annual Meeting, New York City ..... Dec. 2-6
- Aeronautical Chamber of Commerce of America, Inc., Annual Meeting, New York ..... Dec. 5
- National Association of Manufacturers, Annual Meeting, New York... Dec. 9-13
- SAE Annual Meeting, Detroit, Jan. 6-10, 1941
- National Automobile Dealers Association, Convention, Pittsburgh, Pa. Jan. 20-23, 1941

### Shows at Home and Abroad

- Automotive Service Industries Show, Chicago ..... Dec. 9-14
- Machine & Tool Progress Exhibition, Detroit ..... Mar. 24-29, 1941

## 40 YEARS AGO

The first hearing in the long expected Selden patent litigation came to a close on Nov. 9, when Judge Coxe, of the United States Circuit Court, for the Southern District of New York, handed down a decision on a writ of demurrer entered by the defendants, the Winton Motor Carriage Co., of Cleveland, Ohio, and based on the claim that the patent was void for lack of patentability, overruling the demurrer, and leaving the main points of contention for further proof.

From *The Horseless Age*, November, 1900.

## PUBLICATIONS

A new catalog section on its line of hose fittings for gasoline tank, truck distillate and fuel oil hose has been published by the B. F. Goodrich Co., Akron, Ohio.\*

Instruments and time switches built by the General Electric Co., Schenectady, N. Y., are described in leaflet GEA-2753.\*

An attractive brochure commemorating the completion of a plant enlargement program inaugurated in 1935 has been published by the Rustless Iron & Steel Corp., Baltimore, Md.\*

Various types of heating equipment for buildings are described in Form 2640, a leaflet issued by the Young Radiator Co., Racine, Wis.\*

"How to Save Money Handling Your Loads Into, Through, And Out of The Plant" is the title of a bulletin made available recently by The Elwell-Parker Electric Co., Cleveland.\*

"Honed Microfinish for Aircraft Parts" is the title of a new publication prepared by the Micromatic Hone Corp., Detroit.\*

The American Foundrymen's Association, Cleveland, Ohio, has published, as a separate pamphlet, the Malleable Iron Section of its Handbook on Cast Metals.\*

The Jessop Steel Co., Washington, Pa., advises that it has copies of the following publications available for distribution: Folders describing Windsor special air hardening die steel, Truform oil hardening tool steel, 3C and CNS high carbon—high chromium die steels, and carbon tool steels; a booklet on Silver-Ply stainless-clad steel; a chart showing recommended tool steels for over 150 applications.\*

The Magnus Chemical Co., Garwood, N. J., has prepared what it calls "The Aviation Cleaning Handbook." Cleaning methods and materials for use in the maintenance of aircraft, airports and engine shops are described.\*

Carbon dioxide fire extinguishing equipment is described in the pamphlet "In Case of Fire," published by the C-O-Two Fire Equipment Co., Newark, N. J.

Industrial heating installations at Pratt & Whitney, Division of Niles-Bement-Pond Co., Buick, Eclipse Aviation and Pioneer Divisions of the Bendix Aviation Corp., and Divco-Twin Truck Co. are described in the September, 1940, issue of *Trane Weather Magic*, published by the Trane Co., LaCrosse, Wis.\*

An elastic primer that prevents rust on structural steel is the subject of bulletin No. 8-2 published by the American Chemical Paint Co., Ambler, Pa.\*

Röhm & Haas Co., Philadelphia, Pa., has issued a new Plexiglas booklet containing data covering the principal properties and more important applications of cast Plexi-

glas sheet and its companion product, Crystalite molding powder.\*

A course of classroom exercises and lectures covering the oxyacetylene welding and cutting process has been prepared by Air Reduction, New York. The course consists of two separate books: one containing a complete set of work sheets, and the other lecture material to be used as a supplement to the first. The course of classroom exercises sells for 50 cents per copy; lecture books are \$1 each.

Facts concerning polyvinyl acetates, the thermoplastic resins produced by E. I. duPont de Nemours & Co., Inc., Wilmington, Del., are contained in a technical bulletin issued by the R & H Chemical Department of the company.\*

"Brief Facts About Ampco Metal" is the title of a 16-page illustrated booklet issued by Ampco Metal, Inc., Milwaukee, Wis.\*

Quaker State Oil Refining Corp., Oil City,

Pa., has published in leaflet form an article entitled "A New Oil for Modern Motors."\*

"Optics and Wheels" is the title of an interesting booklet which covers the story of lighting from the primitive torch to the sealed beam headlamp. It was prepared by the technical data department, Research Laboratories Division of General Motors Corp., Detroit.\*

Finish baking and drying ovens for synthetic enamels, lacquers, varnishes, paints, enamels and japans, are the subject of a brochure prepared by the Despatch Oven Co., Minneapolis, Minn.

\*Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.

# Thomas Special Finishes Meet Quality Standards ECONOMICALLY

COLD ROLLED  
STRIP STEEL

The finish on cold rolled strip steel is invariably a very important factor and in this respect Thomas is achieving unexcelled results. Thomas electro coated finishes are economically supplied to many manufacturers. The excellent qualities of the coatings frequently eliminate further finishing. They are dependable, and will not crack nor peel during deep drawing and forming operations. . . Let one of our representatives explain how Thomas electro coatings may lower your production costs.

**Thomas Strip**

Bright Finish Uncoated  
and Electro Coated  
With Nickel, Zinc,  
Copper, Brass.

**THE THOMAS STEEL CO.**  
SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL  
WARREN, OHIO



## ADVERTISING

Batton, Barton, Durstine & Osborne, Inc., will assume the automobile tire advertising account of the B. F. Goodrich Co. on Feb. 1, 1941, according to Frank T. Tucker, Goodrich director of advertising. "The appointment will in no way change existing agency relationships for other Goodrich divisions," Mr. Tucker said.

John Jamieson, formerly vice-president in charge of the Chicago Office,

has been named account executive for the Ford account for McCann Erickson, Inc. George Wilcox, formerly with D. P. Brother & Co., Inc., has been named account executive on the Ford truck account.

The December issue of The American Magazine will carry an innovation in modern display advertising. The advertisement will be a Studebaker color "page," done in the new zig-zag layout that has been shown recently to agency men and their clients by American representatives. The zig-zag layout, originated by Norman Bel Geddes, employs the top half of the left-hand page and

the bottom half of the right-hand page for the advertising with editorial matter in the other areas. The advertisement, first of its kind, was produced by Roche, Williams & Cunningham, Inc., Chicago, Studebaker's agent.

D. U. Bathrick, vice-president and general salesmanager of Pontiac Motor Division, in a recent speech before Aircraft Club members, said: What happens to advertising if production of 1942 cars is arbitrarily pro-rated among the various manufacturers or otherwise restricted? In other words: Will we advertise even when customers are standing in line for new cars?

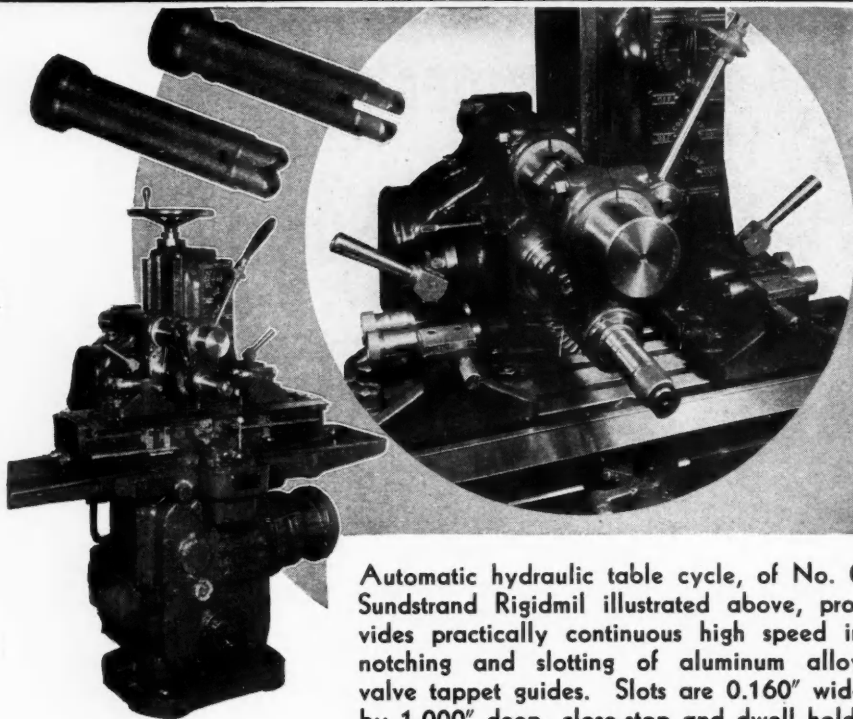
"The answer—so far as Pontiac is concerned—is that we'll keep on advertising. Just as we did during the toughest days of the Depression. Because we're in this business for the long pull—and we aim to stay in business despite what happens in 1942 or 1944 or any other year.

"Business is breaking records this year. It is quite possible that next year there may be more customers than cars. But we'll take out advertising insurance against the day when, again, there are more cars than customers.

"For a customer this year is not necessarily a customer two years from now—unless advertising and the product make him one."

A words-and-music tribute to the automotive industry will be the theme of the Carnation "Contented Hour" on Monday evening, Dec. 2. The Carnation "Contented Hour" is carried by the NBC Red Network and supplementary stations. It is broadcast every Monday at 10 P. M., E. T.; 9 P. M. C. T.; 8 P. M., M. T., and 7 P. M., P. T.

## Sundstrand Rigidmil Speeds Tappet Guide Output



Automatic hydraulic table cycle, of No. 0 Sundstrand Rigidmil illustrated above, provides practically continuous high speed in notching and slotting of aluminum alloy valve tappet guides. Slots are 0.160" wide by 1.000" deep; close-stop and dwell holds depth to  $\pm 0.001$ ". Milling alternately at opposing duplex fixtures, work is changed while cutting progresses.

Rigidmil high-ratio spindle head with quick change pick-off gears gives high surface speed for aluminum alloys and equally effective speeds for steel, cast iron and other materials.

Rigidmils are built in horizontal, vertical and rotary types; with hydraulic or Hydro-Screw feed. Use Rigidmils for maximum milling, lower costs. Get estimates, now, from Sundstrand Engineered Production Service.

**SUNDSTRAND MACHINE TOOL CO.**  
2527 Eleventh St., Rockford, Illinois



Typical standard Rigidmils, No. 0 and No. 1, are fully described in illustrated bulletins shown above. Compare features, advantages, cycles, specifications with present methods and see how Rigidmils will improve your production. Ask for Bulletins 382 and 383.



## RIGIDMILS-STUB LATHES

Tool Grinders - Drilling & Centering Machines  
Hydraulic Operating Equipment - Special Machinery

## MEN . . . . .

Charles E. Dewar, former factory manager for Champion Spark Plug Co., has been named vice-president in charge of production for plants in Toledo, Windsor, Ont., and England. He has been with the company since 1913. Ralph H. Rowland, former sales manager, has been appointed vice-president in charge of sales, and Charles L. Corwin, former assistant sales manager, becomes sales manager.

Joseph Geschelin, Detroit Technical Editor, AUTOMOTIVE INDUSTRIES, will address the Technology Club of Syracuse on Nov. 25. Subject of the talk will be an analysis of the mechanical changes and engineering developments incorporated in the 1941 passenger cars.

George W. Curtis has been named Milwaukee division manager for the Timken Roller Bearing Co., Canton, Ohio. Industrial and automotive bearing sales as well as alloy steel sales



activities of this division will be under his supervision.

**Frederick V. Geier**, president of the Cincinnati Milling Machine Co., Cincinnati, Ohio, has been elected president of the National Machine Tool Builders' Association. He succeeds **John E. Love-ly**, vice-president, Jones and Lamson Machine Co., Springfield, Vt. Other officers elected were: first vice-president, **Clifford S. Stilwell**, executive vice-president, Warner and Swasey Co., Cleveland, Ohio; second vice-president, **George H. Johnson**, president, Gisholt Machine Co., Madison, Wis.; treasurer, **E. C. Bullard**, vice-president, Bullard Co., Bridgeport, Conn. Three new directors were elected for a three-year term to serve on the board of nine. They are **L. W. Scott Alter**, president, American Tool Works Co., Cincinnati, Ohio; **David Ayr**, president, Hendey Machine Co., Torrington, Conn., and **George H. Johnson**. Mrs. **Frida F. Selbert** continues as secretary, and **Tell Berna** as general manager of the association.

**Henry H. Timken, Jr.**, has been named chairman of the board of The Timken Roller Bearing Co., Canton, Ohio. He will succeed his father, the late **Henry H. Timken, Sr.**, in this capacity and will continue as vice-president and general manager of the Steel and Tube Division of the company. **John E. Fick**, superintendent of the steel mill, has been added to the board.

**Merrill C. Meigs**, publisher of the *Chicago Herald* and *American* and well known in aviation circles, has been named to head the aircraft division of the National Defense Advisory Commission.

Mr. Meigs, who succeeds **Dr. George J. Mead**, was named by **William S. Knudsen**, chief of the commission's production division. Dr. Mead resigned to devote all his time to research as a member of the National Advisory Committee for Aeronautics, of which he is vice-chairman. Dr. Mead, former United Aircraft executive, also is chairman of the committee's division of power plant research.

**Henry E. Hund** has been elected president and general manager of **Reo Motors, Inc.**, succeeding **Col. Fred Glover** who resigned several months ago. Mr. Hund was an executive of the **Briggs Mfg. Co.** for 15 years, serving at one time as vice-president and general manager.

**John Oswald**, body engineer since 1929, has been appointed director of styling for Oldsmobile. **Jack F. Wolfram**, experimental engineer, has been named assistant chief engineer in charge of engine, transmission and axle design and development division. **Maurice A. Thorne**, chassis engineer, has been made assistant chief engineer in charge of body, chassis, electrical accessory groups and office administration.

## BOOKS . . . .

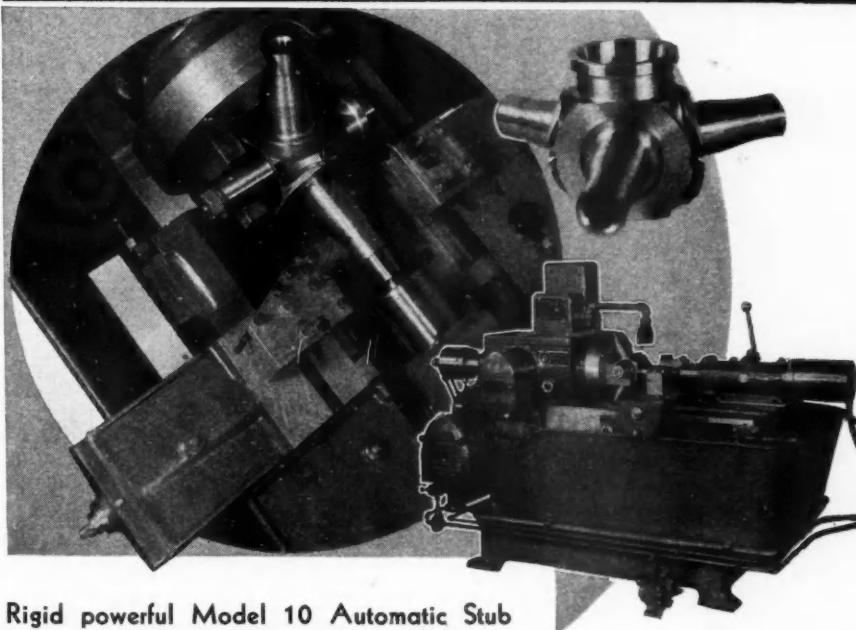
**ARC-WELDING HANDBOOK**, by **Karl Meller**. Translated by **J. E. Webb Ginger**. Obtainable from **Chemical Publishing Co., Inc.**, New York.

The various systems of welding have given rise to a very extensive book literature. The present volume—which is an English translation of a German book—was written, the author informs us in his preface, to describe the process of arc-welding as well as welding

machines and accessories, sufficiently to enable practical men to select and operate equipment appropriate to their various tasks.

A more detailed examination is made of electrodes, particularly regarding their welding characteristics and relative costs, as well as their influence on the weld itself. This statement gives a good idea of the contents. The book is well written and the translation seems to have been made by a man familiar with the subject. The proofs of the translation, moreover, were gone over by a welding engineer of a large electrical firm.

## Automatic Stub Lathe Turns 132% More Propeller Hubs



Rigid powerful Model 10 Automatic Stub Lathe on job illustrated meets exacting requirements easily, and produces 132% more propeller hub spiders than former machining method. Work-piece is hard steel, around 400 Brinell. Turning and facing operations on arms and flanges give extreme accuracy, mirror finish, relation to center axis within  $\pm 0.001$ ". Other Sundstrand Automatic Stub Lathes are giving similar outstanding service on many different airplane parts and other products. Investigate advantages Automatic Stub Lathes offer for your work. Send data for prompt, reliable quotations on specific operations.



Lots of pictures, diagrams and short description in booklet shown above tell clearly why Sundstrand Automatic Stub Lathes are so productive, accurate, economical. Easy to read quickly; contains full specifications. Write today for your copy of Bulletin 391.

**SUNDSTRAND MACHINE TOOL CO.**  
2527 Eleventh St., Rockford, Illinois, U. S. A.

## RIGIDMILS-STUB LATHES

Tool Grinders - Drilling & Centering Machines  
Hydraulic Operating Equipment - Special Machinery



*Operating capacity of the machine tool industry stood at 94.9 per cent of capacity in September as compared with 93.3 per cent for August 1940, according to the National Machine Tool Builders' Association. The industry's capacity measured in terms of payroll hours, states the association, continues to increase, the indication at the end of September being 41 per cent above the same month a year ago.*

## Publications Available on Shop Equipment

(Continued from page 544)

Pillow blocks built by Shafer Bearing Corp., Chicago, are the subject of bulletin 526.\*

Leeds & Northrup Co., Philadelphia, Pa., has published catalog N-01A-600 entitled "Furnace Pressure Control for Metallurgical and Other Industrial Furnaces."\*

Industrial fire hose for mill and plant protection is the subject of catalog section 3750 issued by the B. F. Goodrich Co., Akron, Ohio.\*

Applications for Campbell nibbling machines are discussed in a leaflet prepared by the A. C. Campbell Division of the American

Chain & Cable Co., Inc., Bridgeport, Conn.\*

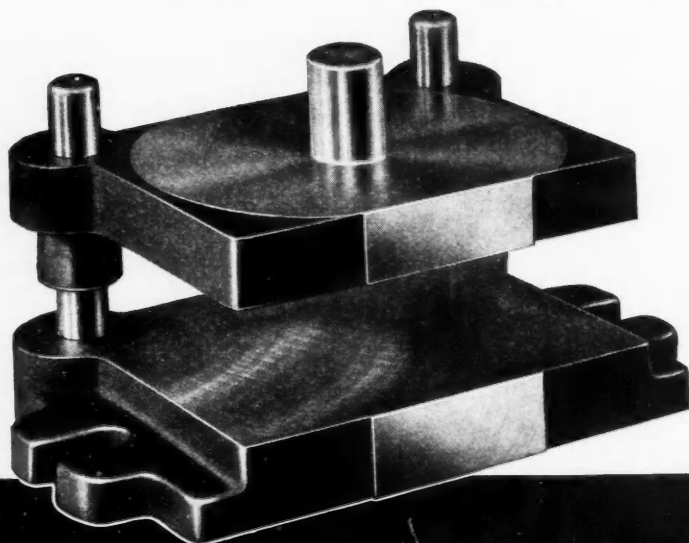
SKF Industries, Inc., Philadelphia, Pa., has brought out a 36-page catalog entitled "SKF Spherical Roller Bearings."\*

Bulletin T-2 prepared by the Development & Research Division of the International Nickel Co., Inc., New York City, contains much technical information on the welding, brazing and soft soldering of Monel, Nickel and Inconel.\*

A booklet entitled "Grinding 'Haynes Stellite' J-Metal and '2400' Cutting Tools" has been issued by Norton Co., Worcester, Mass.\*

Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, N. J., has published a drive data book for **Condor Whipcord Endless Belts**. The same company also has prepared a new bulletin which describes a new vibration dampener bushing now being built into Manhattan wheels for portable grinders.\*

\* Obtainable through editorial department, AUTOMOTIVE INDUSTRIES. Address Chestnut and 56th Sts., Philadelphia. Please give date of issue in which literature was listed.



**PRECISION**  
IS THE KNOWN QUANTITY  
OF DEPENDABLE ACCURACY  
THAT SAVES MONEY IN  
DIE MAKING—AND  
STAMPING PRODUCTION

WRITE YOUR DANLY BRANCH  
**DANLY MACHINE SPECIALTIES, INC.**  
2130 So. 52nd Ave. • Chicago, Ill.

513 E. Buffalo Street, Milwaukee, Wis.	1549 Temple Avenue, Detroit, Mich.
36-12 34th St., Long Island City, N. Y.	16 Commercial Street, Rochester, N. Y.
990 E. Monument Ave., Dayton, Ohio	1745 Rockwell Ave., Cleveland, Ohio
3913 North Broad St., Philadelphia, Penna.	
Ducommun Metals & Supply Company, Los Angeles, Calif.; San Francisco, Calif.	

**DANLY** DIE SETS and DIE  
MAKERS' SUPPLIES

## Change in Address for Copper Development Assoc.

The Copper Development Association advises that it has removed its offices, formerly in Thames House, to Grand Buildings, Trafalgar Square, London, W.C.2, England. G. W. Preston is general manager of the association.

## Back to Business—Government Business

(Continued from page 524)

facturer must know what inspection gages and instruments are going to be used by the government inspector. He should, to play safe, buy and put into use duplicate equipment and put his product through the required testing procedure if he is to hold his rejections to a minimum.

Millions of dollars were lost to manufacturers during the last war period because they failed to define the phrase "minor changes" in their contracts. What, for example, is a "minor change" in terms of dollars? Is a "minor change" a \$1, \$10, \$100, or a \$1,000 change? How many "minor changes" are to be permitted? It is quite conceivable that unless there is some clear-cut and definite statement as to where a "minor change" begins and ends, the prime- or sub-contractor can easily give away most or all of his contemplated profits through "minor changes" and other unspecified alterations of the product.

"How could astute business men make such mistakes" is the obvious question. Hundreds *did* make that mistake during the last war, and at least two contracts studied by AUTOMOTIVE INDUSTRIES this past week show that companies will undertake undefined "minor changes" at the behest of the Government and cut into their estimated profits to the tune of several thousands of dollars.



## THREE JOBS...ONE IRON

Versatility in cast iron — especially when economically obtained... is a valuable asset for both the foundry and the user.

Consider, for example, the experience of a manufacturer of Diesel engines — and the economies effected by using one base iron to meet three distinct sets of requirements. One set calls for ability to resist wear and hold pressure at operating temperatures, the second for toughness and pressure resistance at the same temperatures, and the third for the wear resistance and toughness essential for timing gears and

similar parts. Good machinability is, of course, a prime requisite in all three cases.

All these varied requirements are being met by using the same Chromium-Molybdenum (0.60—0.70% Mo.) base iron; only slight changes in the analysis are necessary. The practical and economical advantages to the foundry are obvious. And the user benefits by getting reliable, machinable parts at reasonable cost.

You will find our book, "Molybdenum in Cast Iron", both interesting and helpful. A copy will be sent free on request.

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No one in his right mind can expect government officials to hand out largesses after the present emergency is over. Congress will, in all probability, clamp down on appropriations of every sort in the economy wave which will inevitably sweep the country following the present huge expenditures.

How, then, is a company to protect itself against losses on war contracts?

A company's accounting and cost system may be thoroughly adequate for its own commercial purposes, but it will be entirely inadequate to meet government requirements. The best standard cost system for management purposes is entirely unacceptable under the regu-

lations covering war order contracts. The Government requires an ascertainment of the *actual* costs and *actual* profits on particular contracts. This is not only difficult to provide, but is a type of accounting that is almost useless for most managerial purposes.

It is no disparagement of the accounting officials of a company to say that, unless they are fortunate enough to have had specific experience in this field, they are not in a position to judge the adequacy of standard cost systems to meet war order conditions. In that it requires specialists, this type of accounting is similar to tax work. Management should insist on a survey of

methods by independent experts.

Naturally, some of these obligations encountered are not of great importance. But many are so important that heavy financial penalties will result not only because of deviations from expressed and implied conditions of the contracts themselves, but also because of failure to meet fully the requirements of the various laws, regulations, rulings, and practices applicable to manufacture under government contracts.

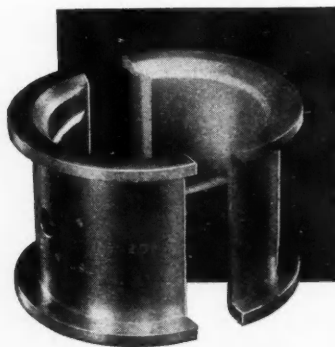
However, these same contracts bring certain rights to the manufacturer. But he must recognize these and exercise them properly in the contract. Should any of these rights *not* be recognized and exercised, he automatically penalizes himself. These penalties include failure to recover all costs rightfully associated with the work, failure to obtain all profit and partial profit allowable, and failure to be repaid for capital expenditures and special outlays, over-payment of profit taxes, and other items never associated with commercial procedure.

Several larger companies consider the problem of such importance that they have government contracts administered exclusively by a department of specially trained and experienced personnel.

Any company undertaking a government contract to supply goods of any kind should set up a department of one man or more to keep track of all records and correspondence bearing upon war order contracts. The department should be the fountain-head of knowledge on war contracts. A separate file with originals or copies of all correspondence to and from government bureaus and departments, whether they appear to be important at the time or not, should be set up. Here should also be filed all laws, rules, regulations, administrative decisions. Contracts, specifications, drawings, material and manufacturing cost records, labor payroll data, minutes of conferences, every mimeographed or written order for changes, whether "minor" or not, should be carefully noted and filed. The department should read and note everything that appears to have a bearing on government work. Procedures by which various government officials may be properly reached should be noted, and names and titles and addresses of government officials connected with the work should be kept for ready reference for executives of the company.

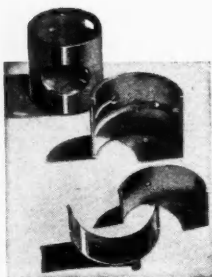
Yes, there is money to be made from war order contracts. But there are fortunes and business to be lost, also. These governmental procedures are so foreign to normal commercial and business practices, however, that some of the attorneys and accountants employed by manufacturers taking on war work must become specialists in government contractual relationships if many plants now working overtime on war orders are not to become desolate shells as soon as the present national defense program is closed.

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